Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 64 NEW YORK, SATURDAY, OCTOBER 31, 1914 No. 18

The Low-Priced Electric Automobile

The problems relating to the production of cheaper electric vehicles for passenger transportation were subjected to a highly critical analysis by those well qualified to differentiate among the many conflicting considerations at the recent Philadelphia convention of the Electric Vehicle Association of America. Many paradoxes came to the surface, particularly the fact that what is being loudly clamored for has been practically at hand for a decade but has not been wanted, at least by the purchasing public. Again, the manufacturer and sales agent, who are supposed to be the greatest beneficiaries from the cheaper article, are the strongest opponents of any crusade in this direction. Furthermore, those manufacturers who are now the most practical exponents of the high-priced luxurious car express the greatest readiness to turn their energies in the new direction whenever the conditions warrant this course. The entire project seems to be pivoted upon the old principle of supply and demand. The users continue to require more convenience, greater interior accommodation, higher speed, longer radius of action, with all the comfort and finery that can be incorporated in the carriage de luxe; and, last but not least, they are willing to pay the price. Many attempts have been made to turn the trend in the opposite direction, but in each instance the result has been to develop a sadder and wiser type of conservative builder who now expresses the hope that some day the more frugally inclined will seek an electric vehicle having an equipment limited to utility and not including the luxuries demanded at present.

Improvement in Financial Conditions

The third month has passed since the war cloud arose in Europe. The constructive forces of this country, hampered as never before in our history, have advanced most encouragingly. The leading spectacular signs of financial improvement are the reduction in money rates and the freer buying of commercial paper. This is an effect, not a cause, and it means that the banking conditions, from which alone this improvement could come, have undergone radical change. Banking psychology leads the lender to seek an outlet for his funds just as soon as the acute stage of a crisis is past and he is no longer liable to sudden, unexpected or unreasonable demands for the money of his depositors. Another sign which bears with equal directness and importance upon our industry is that the bond market is, by all testimony, substantially better. In one large Eastern city it is reported that there is an actual shortage of good municipal bonds to meet an increasing demand. In time this will open the way to the ready purchase of municipal securities by bankers and, in turn, will restore workable conditions for public utility borrowers. The definite arrangements for alleviation of the needs arising from the artificial condition of the cotton-laden South will do a great deal to restore an important section of the country to its normal state. Matters which necessarily are slower of relief are the reopening of trading in corporate securities having an international or active national market and the associated problem of collateral loans held by banks. It will be desirable if the New York Stock Exchange authorities will permit restricted trading soon in a way that will invite investment funds from the unaffected interior agricultural sections and will at the same time absolutely safeguard the banking position. Probably some means of doing this under organized control will be developed, but it is better to delay this move until some step can be taken with so much assurance that, no matter what develops later, it need not be retracted. As for central stations, they still average their traditional good showing in continued strength of gross revenue.

Conference of the Mayors

The conference to be held by mayors of cities in Philadelphia on Nov. 10 to 12 is not wholly an outgrowth of the movement for "home rule" of public utilities. When the conference was first suggested it appeared to be merely an expression of the discontent among municipal officials over their involuntary surrender of regulative powers to public service commissions. As the program published elsewhere in this issue shows, the scope of the conference has fortunately been so broadened as to include representatives of state commissions. This is wise because it means that effective regulation, not municipal displeasure, is the real subject for consideration. Regulation is now very generally in the hands of state commissions, and it is to them that both cities and public utilities look for fair decisions. The state commission has as its sole purpose of existence the performance of regulative duties which, under the old practice, the city exercised as only an incidental part of its vast functions. The city is too vitally interested as advocate or prosecutor to act as judge too, and it is perfectly logical that the semi-judicial, authoritative higher state commission should have been evolved by public desire to put the work of regulation on a more reasonable plane. The part of the cities in the present country-wide policy of regulation is to make the state commissions thoroughly effective agencies. That is also the part of the corporations. Keeping in mind the public will that

state commissions shall have the control, both cities and corporations have a plain duty to perform in safeguarding the integrity of regulation. State commissions cannot do so well or so fairly without the co-operation of cities and companies as they can with it. They need it in their studies, investigations and hearings. With present regulative policies the relations between city and company are not a matter of barter. They involve scientific rate-making, political economy, labor problems, banking and commercial methods, and analysis and careful judgment of the relative weight of each of these considerations. In this large public work the commissions will profit by all of the help that they can get. Whatever the gathering of mayors can do to help in this direction will be put to immediate good use.

Effect of Wave-Form on Moving-Vane Ammeters

One of the most elementary forms of current indicator, long known to electrical workers, was a solenoid coil with an iron core which was attracted into the coil when the latter became excited. For use with alternating currents the core had to be laminated. This device went through a number of modifications in form and dimensions, the principle of operation remaining the same. A very practical form, which has seen much service, consists essentially of a coil of insulated wire supported near to a pivotally mounted sheet-iron vane carrying a pointer over a graduated scale. When the coil is excited the vane moves into the coil and deflects the pointer against a torque either of gravitation or of spring elasticity. The instrument is more particularly adapted to indicate on alternating-current circuits.

The theory of action in such a case is very simply enunciated, although numerical applications of the theory may be very difficult. The iron vane when magnetized acquires magnetic energy. If by any small displacement about its pivots it can acquire more magnetic energy, it will become displaced, provided the increase of energy will pay for the work done in overcoming the opposing torque and friction. The greater the current in the exciting coil the greater the flux-density that can be set up in the iron vane and the greater the magnetic energy and total displacement produced. The indications of the instrument are likely to be affected both by the frequency and the wave-form of the alternating current. The only question is as to the amount of disturbance due to change of frequency or form. As a general rule, it may be assumed that the thinner and lighter the vane the less the eddy-current disturbance, and the lower the range in magnetic intensity the less the hysteretic disturbance.

A series of tests on the effect of changes in wave-form, at constant frequency, on the indications of such an alternating-current vane ammeter have been recently reported by Mr. R. B. Burrowes in the London *Electrician* for a particular instrument not specifically identified. The current strength through the coil of the instrument was varied between 4 amp and 7.5 amp, at a steady frequency of fifty-four cycles per second. The wave-form of the current was varied at each stage by selecting different generators. The crest-factors of the different currents varied from 1.4 to over 2.0, yet the readings of the vane ammeter under test were substantially unaffected by these differences in wave-form. The observations reported may, therefore, be interpreted to mean that in the case of the particular magnetic vane ammeter tested the effect of wave-form was too small to be distinctly observed. Of course, some other magnetic-vane instrument might behave in a different way.

Noteworthy Hydraulic Features of Bishop Creek Plant

In the current section of our account of the work done on the Bishop Creek hydroelectric system there is recorded an interesting example of the difficulties which have to be overcome in installing and maintaining the hydraulic equipment of a high-head plant in a wild country. In constructing plant No. 2 of this system the water had to be conveyed from near the tailrace of plant No. 1 over a distance of some two and a half miles, winding over moderate grades for a distance of about two miles and then taking a downward plunge to the power house. The pipe line, as our readers will note from the detailed description, is a very interesting combination of wood and steel. For the first two miles use was made of wooden-stave pipe, which has made a good record for itself on the Pacific Coast for many years past. Water is taken out of the dam through a 48-in. steel pipe, which is then connected with a 48-in. stave pipe running along the hillside on a nearly uniform grade of 4 ft. per 1000 ft. Numerous horizontal curves were required to accommodate the pipe to grade. Moderate curves up to about forty diameters of the pipe could be made with staves alone, but where there are shorter radii the line consists of wood-stave tangents united by steel-pipe angles. These steel angles are fitted inside the wood pipe for a distance of about 2 ft., the staves being actually built around the steel and firmly banded to make a tight joint. Such joints, which have proved successful for heads as high as 100 ft., enable the cheap stave line to be carried conveniently in very difficult places.

A striking feature of the construction was the care taken with the grading to enable the pipe to be made up in the shop with the necessary horizontal and vertical angles to adapt it to the contour of the trench. Exact data were given to the manufacturer for all the angles from a careful transit survey of grade stakes flush with the bottom of the trench, so that when the 24-ft. sections were delivered they could be placed together without regrading.

At the bottom, where the pipe line ends in a steel manifold with 24-in. branch pipes for the Pelton wheels, a reducing "Y" of cast steel was installed. When a break occurred from a crack in the casting, after the "Y" had done good service for five years, the station was flooded, but, through the activity of the station staff, very little damage was done to the machines.

Then was undertaken one of the most interesting emergency repair jobs that have come to our notice. The crack which developed was about ⅛ in. wide and 5 ft. or 6 ft. long, and the repair was executed by electric welding. The crack was chipped out into a wide "V," and by means of an arc electric-welding equipment molten steel wire was caused to flow into it until a solid weld was made, after which additional metal was applied for a reinforcement and the damaged casting was further strengthened by shrinking and clamping up steel bands. The repaired casting was put into service in about three weeks from the date of the break, the time specified including not only the actual welding, which consumed only five days, but the slow and difficult process of cutting out the casting and all the delays incident to getting the necessary material into place. This was an admirable piece of emergency work, quite in keeping with the resourcefulness displayed in the original construction of the pipe line.

Kinetic Energy of an Electric Vehicle

The ideal region for an automobile is a flat country like Holland or Florida, with no hills and small grades. To rise in level means expenditure in energy. Hilly countries exhaust the storage batteries of electric vehicles. Theoretically, of course, this is not an incontrovertible proposition. In the long run the ups and downs must cancel, and if all the watt-hours of work done against gravitation in climbing a hill were restored when gravitation was allowed to drive the vehicle down hill the drain on the storage battery need not be more than when running over the same length of level road. In some mountain electric railroads of Switzerland using three-phase induction motors these machines are utilized as generators when the car is descending so as to help drive some other car on the ascent. In the great majority of cases, however, electric vehicles make no attempt to regenerate on the downward path. When they go up they work, but when they go down hill their energy goes to swell the entropy of the universe, and they abandon themselves to their gravitational fate.

Mr. T. H. Schoepf, in a paper read before the recent convention of the Electric Vehicle Association of America, proposes to utilize some of the wasted energy of descent in hilly districts, and on electric storage-battery cars, by recharging the battery when going down hill. This plan has, of course, been tried before, in its broad features, but has generally been considered not worth the extra complexity. The author proposes, however, to accomplish the result with only a few extra contacts on the controller and with the addition of an exciter battery of three storage cells. The advantages claimed are an increase in vehicle range, in average running speed and in schedule speed.

It is evident that, granting all that the author claims, there is a certain degree of hilliness within which it is not worth while to introduce the regenerator elements. The only question on which serious difference of opinion is likely to manifest itself is just how much hilliness there must be before the device becomes worth while. It seems very reasonable that it should be worth while on the up-and-down roads, but those who live on hilly country should not blame the flatlanders for being unregenerative in their vehicles.

Radio Telegraphing to Germany

Since the appearance of an article on the transatlantic radio station at Sayville, N. Y., in our issue of Sept. 26, in which the technical possibility of direct radio communication from Germany to the United States was pointed out, authoritative statements have been made to the effect that much of the German war news alleged by a part of the daily press to be spurious was actually received by wireless not only at Sayville, but at Tuckerton, N. J., and in part at Washington, D. C. It appears that until mid-September the greater part of the questioned transmission was from the Goldschmidt sustained-wave station at Eilvese, near Hanover, and that during the night-time the high-frequency spark transmitter at Nauen has since been sending quite reliably to the United States stations. It is stated, further, that telephone-circuit amplifiers of the vacuum-tube type have been in regular use in the Sayville receiving outfit. All this gives interesting confirmation of the contentions advanced in our article, and it is noteworthy that the newspapers loudest in denunciation of the "faked reports" are again printing dispatches received by way of Sayville.

That the Long Island station's sender is not sufficiently powerful to afford regular transmission to Germany, even at night, has been indicated since the day when breakdown of the Tuckerton plant left Sayville as the only means of reaching the European Continent directly by radio. Uncertainty of transmission in the easterly direction has, of course, caused difficulty in acknowledging or requesting partial repetitions of messages to the United States. It is for this reason that the reopening of the Tuckerton station has been impatiently awaited, since its high towers and powerful radio-frequency alternator have given evidence of ability to communicate across the 4000 miles separating them from Eilvese.

On page 853 of this issue Mr. John L. Hogan, Jr., describes the equipment of the Tuckerton installation, which is practically a duplicate of that at Eilvese. The arc which was temporarily installed at Tuckerton in place of the reflection alternator having proved suitable for continuous working, commercial telegraph service has again been instituted even before the arrival of the new generator. In this way transatlantic radio transmission from the United States was re-established during the present week. When the Tuckerton station shall have been reopened with its original installation duplicated there will be ample opportunity to determine just how well the Goldschmidt stations can meet the commercial requirements of continuous day and night service.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Ban on Small Motor-Starting Devices in New York

On and after Jan. 1, 1915, small motor-starting devices, more particularly those used in connection with commercial sewing machines, will be prohibited in New York City, unless of types which have been approved by the Department of Water Supply, Gas and Electricity since July 1, 1914. A number of fires have resulted from the use of the old-style starting boxes, and it is expected that their elimination will be beneficial.

Inductive-Interference Committee Meeting

The committee of engineers appointed by the Railroad Commission of the State of California to investigate the disturbances on telephone lines caused by adjacent energy transmission circuits, and whose recommendations were published in the *Electrical World* of Sept. 5, held its first regular meeting since the presentation of the preliminary report on Oct. 22. In marked contrast to the usual highly technical discussions the business transacted was chiefly general in character. A plan was adopted for carrying on the future work of the committee, which will require the manufacture of additional testing apparatus of special design to supplement the equipment now in service at the field laboratory in Santa Cruz. The next regular meeting of the committee will be held in November.

Arizona Bill Regulating Electrical Construction

Among the bills to be voted on at the coming state election in Arizona is one regulating the placing, erection, use and maintenance of electric wires, cables, supports and appliances and providing punishment for violation thereof. The bill is patterned after the California statute that was found to be impracticable by the California Railroad Commission, which later replaced it with the National Electric Light Association specifications. The standard at present used in Arizona also follows the National Electric Light Association rulings. Advocates of the measure are supporting it on the ground that more effective specifications must be adopted inasmuch as 42 per cent of the electrical workers killed in a short period were electrocuted. It is contended by those opposing the bill, however, that the figures quoted do not take into account the number of deaths which were preventable.

Contracts for Railway Energy

The Texas Power & Light Company has closed a contract to furnish electrical energy for all of the requirements of the Texas Traction Company for thirty years. The minimum requirements under the contract are to be approximately 2000 kw. This arrangement follows a similar contract made some time ago by the Texas Power & Light Company with the Southern Traction Company. The latter contract is for fifty years and provides for all of the requirements of the company with a minimum provision of approximately 2500 kw. Another subsidiary of the American Power & Light Company, the Kansas Gas & Electric Company, has a contract of the same kind to provide the electrical energy for all of the requirements of the Arkansas Valley Interurban Railway for twenty years.

Lamps and Chemistry

On Nov. 10, at 8 p. m., there will be held at the Chemists' Club, 50 East Forty-first Street, New York, a meeting of chemists and engineers to discuss the general subject of the bearing of chemistry on lamp development and the use of lamps in chemical processes. Among the papers to be read and discussed will be the following: "Chemistry in the Development and Operation of Flaming-Arc Lamps," by Dr. William C. Moore, National Carbon Company, Cleveland; "Improvements in the Incandescent Mantle," by Prof. M. C. Whitaker, Columbia University, New York; "The New Tungsten Lamps," by Dr. R. E. Meyers, Westinghouse Lamp Company, Bloomfield, N. J.; "The Quartz-Tube Mercury-Vapor Lamp," by Mr. R. D. Bailey, Cooper Hewitt Electric Company, Hoboken, N. J.; "The New Moore Tube Lamp and the Neon Tube Lamp," by Mr. D. McFarlan Moore, General Electric Company, Harrison, N. J.; "The Light of the Future," by Dr. Herbert E. Ives, United Gas Improvement Company, Philadelphia.

The meeting will be held under the auspices of the New York Section of the American Electrochemical Society with the co-operation of the New York Section of the Illuminating Engineering Society and the American Gas Institute. Dr. C. G. Fink, General Electric Company, Harrison, N. J., chairman of the New York Section of the American Electrochemical Society, is in charge of the arrangements.

Convention of Rhode Island Contractors

The Rhode Island Electrical Contractors' Association held a successful convention at Providence on Oct. 20, the total attendance being nearly 200. The program included a business session in the afternoon and a "get-together" meeting and banquet in the evening at the Narragansett Hotel. In opening the convention President Walter Thurber condemned the individualism which had been so prominent in the industry in the past and pleaded for a larger degree of co-operation among the working units composing the membership. The speakers and topics discussed were: "The National Association," by Mr. George W. Hill, Utica, N. Y.; "Public Service," by Mr. Robert L. Brunet, public service engineer, Providence; "Relation of the Central Station to the Contractor," by Mr. E. R. Davenport, Narragansett Electric Lighting Company, Providence; "The Electrical Contractor and Lighting Service," by Mr. E. P. Baker, Pawtucket, R. I.; "The Relation of the Jobber to the Contractor," by Mr. Arthur K. Moody, Wetmore-Savage Company, Boston, Mass.; "Legislation and the Contractor," by Mr. A. J. Hixon, Boston, Mass. At the banquet Lieut.-Gov. Roswell B. Burchard of Rhode

Island paid a tribute to electrical invention and Mayor Joseph H. Gainer of Providence spoke of the possibilities of co-operation among cities in employing experts. Secretary Henry D. Temple, Worcester, Mass., of the Massachusetts Electrical Contractors' Association, also spoke briefly.

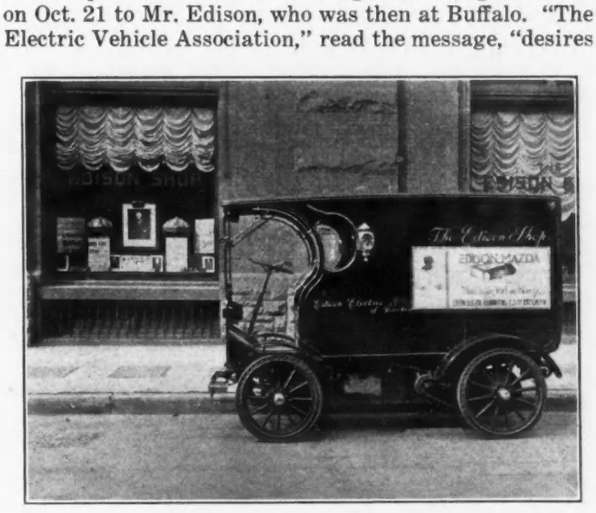
Activities of Commercial Section, N. E. L. A.

The executive committee of the Commercial Section, National Electric Light Association, met at the Hotel Sherman, Chicago, Oct. 23, when reports were read by heads of committees and plans outlined for the commercial sessions of the 1915 convention.

The publications committee, through Mr. E. A. Edkins, Chicago, chairman, announced that 26,000 sets of the house-wiring campaign have been sold during the last three months. Each set consists of a series of seventeen pieces adapted to be mailed to prospective central-station customers at intervals during the year. The committee now plans a much larger edition, from which separate cards or pieces will be sold, depending upon the requirements of the company purchasing them. A special issue of 200,000 copies of the Christmas pieces of the series is now being prepared in anticipation of the holiday demand. The publications committee also contemplates issuing booklets on store service and factory lighting for the use of N. E. L. A. member companies. The next meeting of the executive committee will be held on call of Chairman E. L. Callahan, probably at New York during the second week of December.

Celebration of Anniversary of the Incandescent Lamp

The thirty-fifth anniversary of the invention of the electric incandescent lamp was observed very generally by lighting companies throughout the country. Joining in a common tribute to the genius of Edison, the Electric Vehicle Association of America at its final session in Philadelphia last week sent a telegram of congratulation on Oct. 21 to Mr. Edison, who was then at Buffalo. "The Electric Vehicle Association," read the message, "desires



ADVERTISING EDISON DAY IN BROOKLYN

to congratulate you upon the fact that your services to mankind have been recognized in the selection of Oct. 21 as Edison Day. Your contributions to the arts and sciences are too innumerable to be cataloged. This association desires on behalf of the industry which it represents to thank you for all that you have done to make the electric vehicle possible and economical, with the hope that your efforts will not be relaxed until the electric vehicle reigns supreme."

The Baltimore Section of the National Electric Light Association was addressed on the occasion by Mr. H. H. Wagner, vice-president of the Consolidated Gas, Electric Light & Power Company, who spoke on the stability of the public service company now as compared with the time when Edison invented the first lamp. Mr. Douglass Burnett, commercial manager of the electric division of the company, also made an interesting address on the life of Edison. The Jovian League of Southern California held a special celebration on Oct. 21 in honor of the event. Lighting companies throughout the country took advantage of the occasion to offer bargains in lamps and to advertise in various ways the incandescent lamp by means of portraits, posters, window displays, etc. The Brooklyn Edison Company's display was typical of many others.

At the Edison laboratories in West Orange, N. J., are more than 100 congratulatory telegrams sent to Mr. Edison by electrical engineers, central-station managers, manufacturers, etc., in various parts of the country. These all await Mr. Edison's return from Detroit, for which city he started about two weeks ago on a visit to Mr. Henry Ford, of automobile fame.

Awards in Prize-Story Competition of Society for Electrical Development, Inc.

The Society for Electrical Development, Inc., announces the following as the successful contestants in its recent prize-story competition:

First prize ($250), Mr. Roscoe E. Scott, National Lamp Works of General Electric Company, Nela Park, Cleveland, Ohio.; second prize ($150), Mr. Don Cameron Shafer, General Electric Company, Schenectady, N. Y.; third prize ($50), Mr. George S. Burdick, Scranton Electric Company, Scranton, Pa.; fourth prize ($10), Mr. Russell B. Cressman, manager Opalux Company, New York, N. Y.; fifth prize ($10), Mr. R. E. Plimpton, General Vehicle Company, Brooklyn, N. Y.; sixth prize ($10), Mr. E. C. Myers, General Electric Company, Berkeley, Cal.; seventh prize ($10), Mr. W. H. Garnett, Western Transformer Company, Oakland, Cal.; eighth prize ($10), Mr. W. A. Wolff, Western Electric Company, New York City.

In reaching a decision on the last prizes, there were found to be some stories which, in the opinion of the judges, were so nearly equal in merit that five supplementary "honorable mention" prizes of $5 each were awarded to the following:

Miss Dorothy V. Alison, Denver Gas & Electric Light Company, Denver, Col.; Mr. William H. Easton, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; Mr. Henry A. Germain, General Electric Company, Pittsfield, Mass.; Mr. Joseph W. Price, General Electric Company, Llanerch, Pa.; Mr. A. Morley Underhill, Fort Wayne Electric Works, Fort Wayne, Ind.

Preparing Exposition Illumination Features

The electrical department of the Panama-Pacific International Exposition is now at the height of the construction period. Already 200 of the 400 search-lanterns, which are between 18 in. and 48 in. in diameter, have been set up in their permanent locations. Of these, twenty-three are on the Liberal Arts Palace, seventeen on the Palace of Education, twelve each on the domes of the Palace of Horticulture and Festival Hall, four on the Press Building, twenty on the Palace of

Agriculture, ten on the floral wall, a fan of five on the Southern Pacific Building, and a fan of eight on the California Building.

The Tower of Jewels is being hung with its 125,000 pendent novagems, and fifty fixed projectors are being placed at high vantage points several hundred feet from all sides of the tower to flood its façades with light. On the balcony which encircles the tower 320 ft. above the ground twelve revolving projectors are arranged for displaying a fan of varied colors.

Early in October the finishing touches were put on 450 minor reflectors for nitrogen-filled tungsten lamps. Two hundred of these are 20 in. in diameter, each made up of forty-eight small mirrors arranged around a central parabolic reflector. The lamps are rated at 110 volts and will be used to throw a brilliant light against the banners.

ELECTRIC-VEHICLE DISCUSSION AT CHICAGO

Closer Co-operation Between Various Branches of the Industry—Cheap Electric Vehicle Discussed

The Philadelphia convention, co-operation between central stations and manufacturers and among the manufacturers themselves, the "low-priced" electric car, better facilities for charging and a broader publicity policy were among the topics discussed at a lively session of the Chicago Section of the Electric Vehicle Association of America held at the Hotel Sherman on Oct. 27. President-elect John F. Gilchrist was the guest of honor. In a brief address Mr. Gilchrist predicted that, with closer co-operation between the branches of the industry, proper charging facilities and good roads, the electric vehicle will come to the front and ultimately serve the general public in an overwhelmingly large proportion of cases. The speaker decried the bandying of charges between vehicle manufacturers and central stations that, on the one hand, electrical energy should be sold at lower prices and that, on the other, the prices of cars should be reduced. The central stations as a whole, said Mr. Gilchrist, are not carrying their share of the load in introducing the "electric," although some of the big companies are doing well in this respect and the men down the line are exerting themselves to their utmost. But the value of the electric vehicle as a charging load needs to be brought more forcibly to the attention of many executives. The Lincoln Highway, remarked President Gilchrist, is now provided with adequate charging facilities for electric vehicles practically all the way from New York to the Mississippi River with the exception of a short stretch of mountain road in Pennsylvania, and this section will shortly be equipped by neighboring central stations. In closing, Mr. Gilchrist touched upon the field of possibilities lying open before the electric vehicle and referred to the rapid progress made by the E. V. A. during the administration of his predecessor, Mr. Frank W. Smith, of New York.

Mr. E. L. Chalfant, secretary of the Electric Automobile Manufacturers' Association, an organization of six leading electric-vehicle makers, which has headquarters in Chicago, told of his aim to get the manufacturers closer together in the electrical-car field as has already been done in the gasoline-car industry. He discounted discussion of the so-called "cheap" electric automobile and said that the public has received erroneous impressions of the statements made by Dr. Steinmetz, Mr. Edison and Mr. Ford concerning low-priced electric vehicles. Instead of looking toward such popular use of the electric vehicle, Mr. Chalfant urged its further adoption as a central-station vehicle in the field for which it is best fitted, and suggested that a car designed by central-station engineers to meet central-station needs would find ready manufacture and ready sale. Mr. Walter Wardrop contrasted the excellent organization and complete data available in the electric-vehicle field with the lack of understanding of their products and industry which obtains among representatives of many of the 600 manufacturers of gasoline cars. Mr. W. G. Pancoast, of the Rauch & Lang Company, Cleveland, Ohio, said that the tendency of electric pleasure-car buyers has been distinctly toward more expensive types and designs, citing the fact that the makers of the various "low-priced" cars already brought out have all except one met with financial disaster. The single exception, he added, is now in the hands of a receiver. Mr. D. C. Arlington made a renewed plea for an inexpensive electric car which could be classed with other "domestic utilities" of central-station service. Mr. Harry Salvat cited a case where a central-station manager was unable to help an electric-truck purchaser to charge his car. This apathy on the part of the manager almost lost the sale of the truck after it had been delivered from a city 20 miles distant under its own power, and did result in the installation of a private gas-engine-driven charging plant. Chairman W. J. McDowell, Messrs. C. B. Frayer, G. A. Freeman and others reported on the Philadelphia convention, and by unanimous vote Chairman McDowell and the members of his administration were continued in office for the rest of the electoral year.

CONFERENCE ON PUBLIC UTILITIES

Program of Important Meeting of American Mayors to Discuss Public Policies Concerning Municipal Utilities

The program has been issued for the conference of American mayors on public policies concerning municipal utilities to be held in Philadelphia on Nov. 12 to 14. The conference was called by Mayors Blankenburg of Philadelphia, Mitchel of New York, Harrison of Chicago, Baker of Cleveland and Shroyer of Dayton. A reception to visiting mayors and delegates will be held on the evening of Nov. 12 at the Bellevue-Stratford Hotel. Governor Tener of Pennsylvania is to make an address of welcome.

Sessions on the Problems and Regulation of Utilities

The first business session will be held at the Bellevue-Stratford Hotel at 10:30 a. m. on Friday, Nov. 13. The general subject is "Practical Utility Problems." Mayor Blankenburg will preside. The following addresses are on the program: "Fundamental Planks in a Public Utility Program," by Mr. Delos F. Wilcox, franchise expert, New York; "The Regulation of Municipal Utilities," by Mr. Nathaniel T. Guernsey, general counsel American Telephone & Telegraph Company, New York; "Philadelphia's Transit Problems," by Mr. A. Merritt Taylor, director of city transit, Philadelphia; "Municipal Lighting Rates," by Mr. Ray Palmer, commissioner of gas and electricity, Chicago, Ill.; "Laborers' Interest in Public Utilities," open discussion.

The program for the afternoon session, on the general subject of "Regulation of Utilities," is as follows: "Some Present-Day Issues in Regulation," by Prof. Edward W. Bemis, board of supervising engineers Chicago Traction; "What Certain Cities Have Accomplished Without State Regulation," by Mr. Stiles P. Jones, secretary Voters' League, Minneapolis, Minn.; "A Constructive Policy for Public Service Corporations," by Mr. Charles Day, of Day & Zimmerman, Philadelphia; "What Regulation Must Accomplish if

It Is to Be Permanent," by Mr. John M. Eshleman, president Railroad Commission of California. The third session, under the auspices of the American Academy of Political and Social Science, is to be held at the Central High School at 8:15 p. m. on Nov. 13 and is to be devoted to local and state regulation of municipal utilities. Mayor Mitchel of New York is to preside, and addresses are to be heard from Messrs. Halford Erickson, Railroad Commission of Wisconsin; Milo R. Maltbie, New York Public Service Commission, First District; Charles E. Merriam, professor of political science, University of Chicago, and Ira W. Stratton, Mayor of Reading, Pa.

Municipal-Ownership and Holding-Company Sessions

The fourth session is to be at the Bellevue-Stratford at 10:30 a. m. on Nov. 14 and is to be on municipal ownership and operation. Mayor Baker of Cleveland will preside. An address on "Municipal Ownership—the Testimony of Foreign Experience," will be made by Mr. Frederick C. Howe, commissioner of immigration, New York. Fifteen-minute reports will be heard from managers of typical municipal plants. There will be an open discussion led by Mr. Clarke M. Rosecrantz, of general counsel Milwaukee Electric Railway & Light Company, and Congressman Robert Crosser of Ohio. The fifth session, in the afternoon, will be executive and open only to mayors and delegates. There will be a round-table discussion on "elements in a constructive utility program."

The sixth session will be held at Witherspoon Hall under the auspices of the American Academy of Political and Social Science on the evening of Nov. 14 and will be devoted to holding companies and the public welfare. Secretary of the Interior Franklin K. Lane will preside. Addresses will be made by Messrs. Francis T. Homer, of Bertron, Griscom & Company, New York; Charles F. Mathewson, counsel Consolidated Gas Company, New York; James P. Goodrich, director National City Bank, Indianapolis, Ind., and Louis D. Brandeis, Boston.

So far mayors of 124 cities have indicated their intention of attending the conference in person or by delegate. Delegations have also been appointed by civic organizations and public service commissions.

The Utilities Bureau

The program contains a reference to the Utilities Bureau, organized by the mayors who called the conference. The purposes of the bureau are given as follows: (1) To serve as a national agency through which American cities may co-operate in exchanging data as to rates, service standards and cost factors in municipal utilities; (2) to advise cities as to the best plans and methods for their utility campaigns; (3) to publish and disseminate information pertaining to service standards, rates, franchises, public contracts, and any and all other matters of interest and value to the public regarding the operation, construction, maintenance and regulation of public utilities; (4) to assist, upon request, in the proper and adequate presentation of the interests of the city and the public in hearings on utility matters before public service commissions or other regulative or judicial bodies. The trustees are Messrs. Louis D. Brandeis, lawyer, Boston; Frederick A. Cleveland, political economist, New York; S. S. Fels, manufacturer, Philadelphia; Felix Frankfurter, professor of law, Harvard University; Charles F. Jenkins, proprietor *Farm Journal*, Philadelphia; Leo S. Rowe, professor of political science, University of Pennsylvania; Frederick W. Taylor, consulting engineer, Philadelphia, and Charles R. Van Hise, president University of Wisconsin.

ELECTRIC-VEHICLE CONVENTION

Abstracts of Additional Papers Read Before the Philadelphia Gathering and of the Discussions That Followed Their Presentation

In the *Electrical World* of Oct. 24 the transactions of the Electric Vehicle Association of America at its Philadelphia convention were briefly outlined and abstracts and discussions of some of the more important papers were given. Abstracts of the remaining papers, together with discussions which they brought out, are given herewith.

Electric Vehicles in Europe

According to Mr. P. D. Wagoner, the development of the electric vehicle in Europe began in 1881, and he gave a brief historical outline of its evolution up to the present day. There are now approximately 3200 electric vehicles in the whole of Europe. The number of electric trucks, however, is very small and the development of those in use has been along highly specialized lines. Few of the electric passenger cars compare with the luxurious cars of America. In England the electric car is receiving considerable publicity, and up to the time of the war splendid progress had been made in providing electric taxicabs, fire and street-cleaning apparatus in Germany. Electric vehicles were used rather extensively in mail service in Germany also, as well as in Vienna, Austria. Mr. Wagoner discounted any unfavorable effect of the war on the future of the electric vehicle and declared that the outlook in Europe is reasonably bright.

Electric Fire Apparatus in Philadelphia

In his paper entitled "Electric Fire Apparatus," Mr. George S. Walker, chief mechanician of the Philadelphia Fire Department, gave some details of the operation of electric fire vehicles used by the city, comparing them with gasoline and horse-drawn apparatus. The comparison revealed the decided advantage of the electric apparatus. Mr. Walker told how with snow on the ground the electric vehicle was far more reliable than the other conveyances. The battery tractor, he declared, surpassed the gasoline apparatus in answering alarms because of the simpler control and its ability to start more quickly.

Committee on Insurance

The committee on insurance was able to secure only one concession on insurance of electric vehicles, and it was suggested that members place insurance with those companies making special rates on electric vehicles and centralize on as few companies as possible.

Mr. Dana Pierce, of the National Board of Fire Underwriters, in discussing the report, pleaded for an electric vehicle which would be safe and reliable. Co-operation, declared, was necessary in the development of good practice.

Cheap Electric Car Not Wanted

In reply to the claim of Dr. Steinmetz at the recent Philadelphia convention of the National Electric Light Association that a low-priced car was a possibility, Mr. J. Crawford Bartlett read a paper entitled "An Answer to Dr. Steinmetz," in which he declared that the low-priced car has been developed but long ago proved impracticable. No one wants it, he claimed. The desire for luxurious fittings and large mileage radius has conspired against the cheap electric vehicle. There was a flood of cheap cars during the development stage of the electric vehicle and they did the industry untold harm. A weak, puny electric car is not wanted; the sturdy long-distance car is in demand.

Mr. R. L. Lloyd directed attention to the fact that Dr. Steinmetz had compared the electric-vehicle development with that of the bicycle. So long as the bicycle was a

luxury the price was high, but as soon as it became an aid in business and therefore more or less of a necessity the price was lowered.

Electric Truck and Its Applications

"Special Applications of the Electric Truck" was the subject of an illustrated paper by Mr. F. Nelson Carle, who stated that as long ago as 1906 the electric truck reached a point where it could be standardized as to basic design and that there have been no radical departures since then. He divided the past fifteen years of development into three periods, that from 1900 to 1905 being one of experimentation, the next five years one of standardization, and the period from 1911 to the present day one of specialization. Following these periods, the author declared, should come that of quantity production. Mr. Carle urged the necessity of co-operation between the buyer and seller and the need of adopting various types of standardized trucks to new kinds of work.

Electric Vehicles in Central-Station Service

In a paper entitled "Power Wagon Operation in Central-Station Service," Mr. W. A. Manwaring recited the diversified uses to which trucks for central-station service are put. It is the aim of all central-station companies, he declared, to provide quick transportation at the lowest possible cost, and it is with this end in view that the electric truck has been adopted. It is difficult for a transportation department of a central-station company to show a book profit when comparing electric vehicles to horse-drawn trucks. The advantage in any electric truck lies in its ability to cover the required distance between jobs with all possible speed and a minimum delay. The greatest drawback to the universal adoption of the electric vehicle by the central stations is the high first cost.

Discussion

Mr. W. P. Kennedy claimed that the cost of the commercial electric vehicle is not too high. One should consider the great amount of work performed and the increased efficiency of the workmen.

Mr. J. F. Gilchrist stated that of the trucks used by the Commonwealth Edison Company 20 per cent were usually kept out of service for painting or repairs. The trucks, he said, were painted twice a year. His company had experimented with a drying oven for the painting operation, but not much time could be saved.

Educating the Public

Mr. F. C. Henderschott, chairman of the N. E. L. A. committee on education of salesmen, read a paper entitled "Educating the Public in the Field and Use of the Electric Vehicle," in which he emphasized the importance, in a selling campaign, of carefully compiling a list of prospective buyers who promise the largest measure of returns. Admitting that there can be no better advertisement than a satisfied customer, the first effort should be to get the electric car favorably introduced into the community. This can be better accomplished by carefully selected lists of prospective customers than by general publicity campaigns. Educational effort should be conducted jointly by the manufacturer and the local central station. The author also suggested that the influence of owners of electric vehicles in the community be utilized.

Operating Costs of Commercial Electric Vehicles

Mr. W. P. Kennedy in a paper the subject of which was "A Practical Project to Secure Authentic Cost of Operating Commercial Electric Vehicles" directed attention to the growing demand for reliable information on operating costs. There have been many efforts to obtain information of this character, Mr. Kennedy stated, but in most cases these efforts have lacked comprehensiveness and when investigated by the manufacturers they have not always been impartially regarded. Mr. Kennedy stated that an investigation should be inaugurated by an independent authority, and, apropos of such a need, he gave details of a movement which the *Electrical World* has begun to determine the results which the actual users of electric vehicles have experienced in the cost of operating their equipment. This information the *Electrical World* is purposing to publish.

Mr. H. F. Thompson suggested that everybody lend his co-operation to such a project as Mr. Kennedy outlined in his paper. Work of this character, he declared, can never be completed.

Co-operation of the Society for Electrical Development

Mr. J. M. Wakeman, manager of the Society for Electrical Development, Inc., spoke of the efforts of his society to distribute information on all electrical topics and asked for closer co-operation between the Electric Vehicle Association and the Society for Electrical Development. He told of the society's desire to be of service to the Electric Vehicle Association and what it had already done to spread the knowledge of electricity. In the motion-picture films of the society whenever an automobile is used it is an electric one.

Constant-Potential Charging System

In a paper entitled "Constant-Potential System of Charging from Motor Generators," Mr. H. P. Dodge described the charging equipment used in a St. Louis garage. The installation consists of two 35-kw shunt-wound generators operated by three-phase, sixty-cycle motors. A Tirrill regulator is employed for each generator. In most cases for the first five minutes of charging a current of 150 amp is necessary. Each motor-generator set is independent of the other, but the switchboard provides means for throwing any charging plug on either generator set.

Low-Priced Car Impracticable

"The Trend of Electric-Vehicle Manufacture" was the title of a paper read by Mr. H. H. Doering, in which he averred that the day of cheap electric automobiles has come and gone. Almost without exception the manufacturers have discarded the low-priced car. Instead of a cheap, light, short-mileage automobile the trend is in the opposite direction and manufacturers are making bigger and better cars. The demand for luxuries has also tended to make the electric car more expensive.

Discussion

Mr. J. Crawford Bartlett stated in the discussion following Mr. Doering's paper that the public has no means of judging an electric car and the more reputable a manufacturer becomes the more readily can his product be sold. Mr. Bartlett lamented the practice of some manufacturers who boost the prices of their product simply because some people will buy an article which is high-priced.

Characteristics of Vehicle Motors

In a paper by Mr. H. S. Baldwin entitled "The Electric Automobile Motor" were outlined the development of electric-vehicle motors and batteries and the characteristics of present-day apparatus. As a rule, the earliest motors were comparatively light in weight, operated at high speeds and good efficiencies, but had rather highly saturated magnetic circuits. In commenting on modern vehicle motors it was suggested that voltages in the vicinity of 110 volts should be employed as the batteries can be charged more efficiently from electric-service circuits. Series motors having relatively low flux density in the magnetic paths were recommended

for commercial vehicles which are required to start and stop frequently and ascend steep grades. On the other hand, a passenger-car motor should have a more highly saturated field to give high speeds on grades.

Discussion

Mr. Day Baker and Mr. J. P. Mallet took part in the discussion following the reading of Mr. Baldwin's paper. Mr. Baker declared that the information contained in this paper is valuable for the men selling electric vehicles. The motor, he asserted, is often abused, and if the salesman imparts to the prospective purchaser the proper kind of information regarding its operation it will receive greater care than otherwise. Mr. Mallet mentioned the possibilities of the shunt-wound motor for conserving the energy in the battery.

Motor Calculations

Mr. A. A. Nimms in his paper on the "Calculation of Electric Motor Characteristics and Prediction of Vehicle Performance" assumed the proportions of a series motor suitable for use with electric vehicles and computed its characteristics in order to determine the performance of the car. The computation of such motor characteristics and vehicle performance, Mr. Nimms stated, tends to emphasize the relation between the voltage, speed, watts and torque of the motor. Vehicle movement, Mr. Nimms stated, depends upon the inertia, train resistance and gravity, all of which must at times be overcome by the torque of the motor. The values of these factors were analyzed and their effects on vehicle movement computed.

Utilizing Kinetic Energy

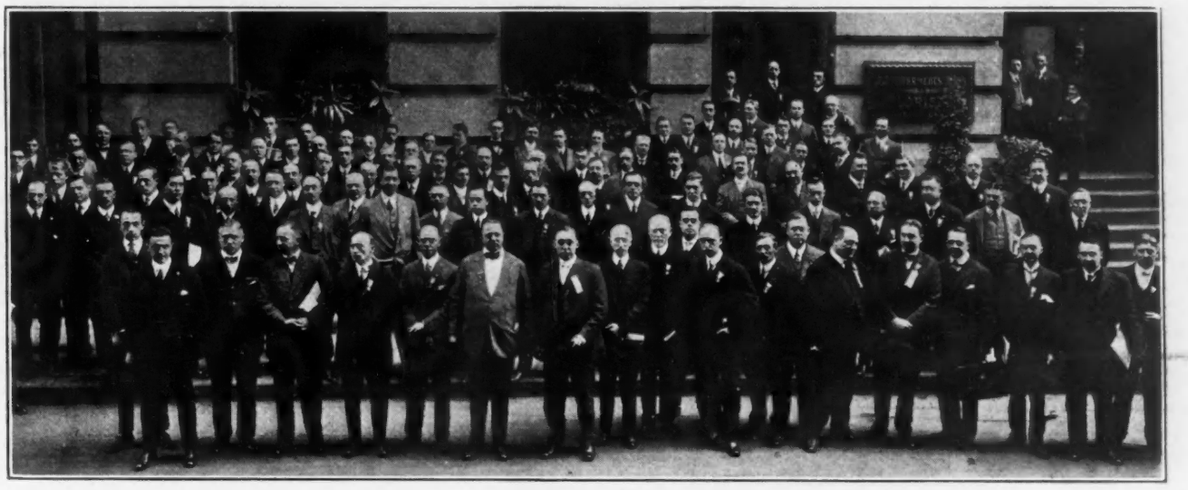
In cities having many grades greater mileage and higher speeds can be secured, it was stated in a paper entitled "Effects from the Utilization of the Kinetic Energy of an Electric Vehicle," which was prepared by Mr. T. H. Schoepf and read by Mr. A. Carrel, by increasing the rating of the battery and the number of cells or by substituting an equivalent in order that the electric vehicle may become an economical means of transportation. The simplest equivalent is frequent boosting, which, however, is limited owing to the lack of properly equipped stations. Boosting the charge of the storage battery while the truck is standing at the loading stations is sound in principle, and if this is augmented by charging from the motor acting as a generator when the truck is under way the ideal is approached. The author gave the results of tests performed with a standard truck by adding one or two contacts to the controller and increasing the number of cells in the battery.

Operating Data on Central-Station Electric Vehicles

"Electric Vehicle Performance in Central-Station Service" was the title of a paper read by Mr. Robert B. Grove in which he summarized the performance of the electric vehicles used by the United Electric Light & Power Company of New York City. The equipment of that company, Mr. Grove stated, consists of twenty-seven vehicles of varying types, according to the nature of the service performed. Two garages are maintained. The vehicles are inspected at the finish of each day's operation, and necessary repairs are made whenever it is possible to do so during the night. The author described a number of small forms which are used in collecting and tabulating performance data.

Charging in Private Garages

Mr. J. F. Lincoln emphasized the importance of properly charging the batteries of pleasure vehicles in his paper entitled "Charging Apparatus for the Private Garage," and stated that the charging apparatus must have a great many automatic features in order to give the battery the proper tapering charge and always keep it below the excessive gassing rate without attention. Mr. Lincoln outlined some of the advantages and disadvantages of the mercury-arc rectifier and described the "Lincoln" electric charger.



GROUP OF DELEGATES AT PHILADELPHIA CONVENTION OF THE ELECTRIC VEHICLE ASSOCIATION OF AMERICA

Electric Industrial Truck

"The Electric Industrial Truck" was the title of a paper containing information on electric trucks contributed by the following manufacturers: The Automatic Transportation Company, the Elwell-Parker Electric Company, the General Vehicle Company and the C. W. Hunt Company. A prologue to these contributions was read by Mr. S. G. Thompson.

Water-Power Construction in California

The California State Water Commission has issued a report covering its activities from March 23, 1912, to April 1, 1914. Construction is progressing actively on seven permits for the use of water for power purposes, and the total expenditure involved in this work is $5,941,300. Of the seven permits pending, the largest affects the Clear Lake and Cache Creek project of the Yolo Water & Power Company. This involves 50,000 theoretical hp, and the development is to cost $5,185,000.

Business Conditions in the Industry

Mr. Alex Dow Discusses Large Increases in Detroit and Manufacturers Tell the Effects of the European War on Their Domestic and Foreign Trade

MR. ALEX DOW ON LARGE DETROIT GAINS

Gross Increases of 13 per Cent in August and 16 per Cent in September Hold Encouragement

Mr. Alex Dow, president and general manager of the Edison Illuminating Company of Detroit, who has been in New York for a few days, told a representative of the *Electrical World* that the normal increase in business of the company is affected only very slightly by conditions arising from the European war. This is shown by the fact that earnings in August this year were 13 per cent greater than in August, 1913, while in September they were 16 per cent greater. The estimate of Mr. Dow is that the full calendar year will show probably a gain of 14 or 15 per cent over 1913. Last year showed 25 per cent gain over 1912.

"Because of financial conditions we have postponed a good deal of construction work that would be desirable," said Mr. Dow. "The Conners Creek plant, which is now under construction, will help us materially. We, of course, shall finish the generating plant there. We had planned to build three substations, but we can get along without two of those for the present and probably will do so. In order that we may have the benefit of our increased generating capacity the work on the distribution system will necessarily continue. A certain amount of construction can be continued economically with our own organization. With other construction, however, we will await improvement in financial conditions.

"As showing the gain in business we added 2120 customers in September. Of these 1500 to 1600 are new-residence customers, mainly people who have built new houses. On the average we connect 100 or so a month of old residences not previously wired, and we secure practically all the new houses built. Our September record in new customers was almost the high record month of our history. In large part it represents the result of building operations which have been under way for some months, but we do not regard it as by any means a phenomenal showing. It is characteristic of the generally favorable business conditions which exist in Detroit.

"The great diversity of industries in Detroit is just as important to that city as diversity of load to a central station. It has done a great deal to build up Detroit and make it the active, prosperous city that it is to-day. Dull times in one section or industry in the city are offset by good times in another. The reduction of active business in some lines because of the operations in the theater of war is offset by increased momentum in other directions due to the same cause. In some plants which make motor trucks, for instance, orders are on hand for all that can be built in a given time, and three shifts of men are kept at work so as to have the plant in operation night and day.

"The August gain of 13 per cent over the corresponding month of last year is unusually low for us and is due to the fact that some of the industries which are large consumers of energy closed for repairs or overhauling in the summer months. The tremendous diversity of industries in Detroit has greatly strengthened the banking position there, and business men of the city are positively assured that their legitimate requirements will be met. We are assured of what we will require for our present needs, but at this time the financial conditions do not warrant commitments in advance to any material amount of capital expansion during 1915. We see no occasion to cut either dividends or wages—only to be cautious about expansion."

Mr. Dow was asked about the work of the new-business department and he replied: "Our force is having time to do a good deal of visiting at the offices of customers. We are working especially on those manufacturers whose activity has been lessened by financial conditions. We are urging concerns of this character to introduce the economy of electric drive. With us dullness, temporary or periodic, in any industry has always meant that we get new business from that industry. We are always running tests and making engineering studies of existing plants. When we find a manufacturer ready to take our energy we give him the name of local agents of electrical manufacturers and he buys the equipment directly from them. As a result of our studies it has occurred frequently that manufacturers have been able to make actual manufacturing economies in their plants. We do not hesitate to make suggestions to a manufacturer that enable him to introduce manufacturing economies. We do that irrespective of whether or not he becomes a customer immediately. We are willing to do that much good and take a chance that some time in the future we shall find the manufacturer ready to buy energy. When we get a manufacturer to take our advice to his advantage on a mechanical problem it creates a friendly feeling for the future. Our salesmen are often on exceedingly friendly terms with customers. Our whole aim is to get in personal touch with customers. Our business policy has been absolutely continuous in this respect since I went to Detroit in 1896."

In reply to a question, Mr. Dow said that the normal annual capital expenditure of the company is about $3,000,000. On account of the construction of the new generating plant this year more has been expended, but next year the average will apparently be below the normal amount. On account of the exceptional earnings shown and the position of the company in a city that is doing well in its varied industries, Mr. Dow is encouraged over the general business outlook. He believes that conditions are improving radically.

HOW MANUFACTURERS SEE THE OUTLOOK

Trade Conditions and Export Possibilities in Different Branches of the Industry

Statements from manufacturers, given to the *Electrical World,* are as follows:

August Business Greatest Known

Leeds & Northrup Company, Philadelphia: "The export business of this company has not been very large and has not come to us because of any great effort on our part to secure it. We have advertised in circular form quite considerably among the colleges in some countries, but we have made no other effort to secure their business. Since our export business has been such a small proportion of our total business, we do not look for any bad effect upon our volume of business this year due to the falling off in exports. It so happens that

from the nature of our business there is very little opportunity for export to the countries directly involved in the war. Germany, England and France all have instrument factories of quite high grade, and it would be difficult for us, under the best conditions, to secure much of a foothold in these countries. The larger part of our business in the export line has gone to Japan and China, and quite a considerable amount to Australia. We very frankly state that we cannot see much light in regard to the question of South American business in our particular line. We are certainly going to make efforts to secure what business there may be for electrical instruments in the countries of South America, but, as stated above, we are not in a position to state definitely, one way or the other, the probable amount of business which is available. We do not look for any great decrease in the volume of our business for this year because of the war conditions. In the first part of August, during the first days of the war, our business fell off materially, but during the latter part of the month it picked up to such an extent that the total volume for August was greater than for any August in the history of this business, and further the total business for the quarter ended June 1 was greater than that for any other quarter with one exception, this exception being due to a special order involving a large amount of money. We have not decreased our organization in any way; in fact, we have, during the last month, strengthened our selling force, not so much for the sake of export trade as for home business. We have been somewhat dependent upon European countries for raw materials, but fortunately we are quite well stocked with the more important materials, and when these stocks are exhausted we fully believe that the same materials can be secured in this country, so that we do not anticipate any difficulty due to inability to secure raw material."

Expect Stimulation After War

Mr. V. L. Yessen, H. B. Camp Company, Pittsburgh, Pa.: "It is our opinion that the war will have a stimulating effect on exports of our conduits to Europe; that is, after peace has been declared. There are, of course, countless miles of electric communication and light transmission wires now being destroyed which eventually will have to be replaced and possibly with underground service. We do not anticipate any increased business emanating from South American countries in our line as, to the best of our knowledge, practically all clay conduits used in these countries have been furnished by American manufacturers, and the war would therefore not have any direct influence on conditions there. We have always enjoyed a very good business with our neighbors to the South in the conduit line and confidently look for a continuance of this. None of our raw materials are imported, and we are therefore not affected by curtailment of production in the European countries."

Expects Trade of Countries Not at War

Mr. B. G. Stauffer, treasurer and general manager Fidelity Electric Company, Inc., Lancaster, Pa.: "The effect of the war upon our individual business to date has been slightly detrimental. We have been exporters for the past fifteen years to a limited extent, but customers to whom we furnish our apparatus are also exporters, which indirectly affects us. We all expect that the countries not in the war will turn to the United States for their imports. However, we have not been benefited so far by a change of this kind. We are not dependent upon European countries for any of our raw materials. Our factory is operating with its normal force for this time of the year."

Appliance Business Good

Mr. Harry G. Seaber, vice-president and sales manager of the Brokaw-Eden Manufacturing Company, of Chicago, in talking with a representative of the *Electrical World*, said that at the time the European war was begun the officials of that company were puzzled as to what course to take. The prevailing opinion in business circles at that time was one of doubt and uncertainty. The Brokaw-Eden company manufactures electric washing machines and appeals to housewives on the ground of economy. Nevertheless, it may be difficult to induce buyers to make an immediate outlay in dull times to secure an ultimate economy. The cash receipts of the company were reduced greatly in the first days of August. To be on the safe side, the directors of the company decided to reduce expenses and curtail activity in the manufacturing department. The sales force was not cut down, however, and was instructed to be more active than ever. The result was not at all discouraging but distinctly encouraging. By Aug. 15 remittances began to come in, and by the end of that month business and collections were nearly in normal volume. September proved to be the biggest month in the history of the company, with a greater volume of business than June or July, which were record-breaking months. Mr. Seaber is confident that business will be good all the rest of the year. He thinks that, with appliance manufacturers particularly, now is the time to press for new business. Business is particularly good in the West, and notably so in and near Kansas City.

FACTS ABOUT EXPORT CONDITIONS

Information Bearing on Development of Opportunities in Foreign Fields for American Manufacturers

Mr. Verne L. Havens, who has been appointed commercial attaché of the Department of Commerce at Santiago, Chile, has been in New York interviewing manufacturers in regard to his future work. Mr. Havens has returned to Washington but will be in New York again before his departure for Chile. Mr. Havens is an engineer and has been connected with the electric railways in the cities of Mexico and Havana and with the Mexican Light & Power Company. He also was connected with the Presidio & Ferries Railroad of San Francisco. He speaks Spanish and will devote his efforts to the collection of information that will be of value to manufacturers of this country. The following other new commercial attachés have also been in New York conferring with business men for a few days before their departure for their posts: Messrs. Albert Hale, Buenos Aires, Argentina; A. L. Harrington, Lima, Peru, and C. W. A. Veditz, Paris.

At the fifth annual convention of the American Manufacturers' Export Association, held in New York on Oct. 21, the following officers were elected: President, Mr. Alba B. Johnson, president Baldwin Locomotive Works; first vice-president, Mr. Charles A. Schieren, president Charles A. Schieren Company; second vice-president, Mr. A. N. Hargrove, J. G. Brill Company; third vice-president, Mr. W. F. Adam, Clarence Whitman & Company; treasurer, Mr. E. H. Huxley, manager foreign department United States Rubber Company; directors (three-year terms), Messrs. James A. Farrell, president United States Steel Corporation, and M. A. Oudin, foreign manager General Electric Company. The directors held over are Messrs. W. N. Dickinson, General Elevator Company; W. S. Gavan, E. I. du Pont de Nemours Powder Company; W. E. Leigh, Western Electric Company, and A. W. Ransome, Ransome Concrete Machinery Company.

PUBLIC SERVICE COMMISSION NEWS

Illinois Commission

As the city of Jerseyville, Ill., and the Central Illinois Public Service Company failed to reach an agreement on electric rates, the commission on Oct. 22 ordered the company to prepare and present an appraisement and inventory of its property in order that just rates might be determined.

The commission denied the petition of the city of Rock Falls, Ill., for a rehearing in the case in which the commission approved the sale of the property and franchise in Rock Falls of the Northwestern Barb Wire Company to the Illinois Northern Utilities Company. The city said that it has a municipal plant that is being improved and that there is not room for two electric plants in the city. The commission holds that the electric franchise held by the selling company was good and that it was transferable.

Massachusetts Commission

The Gas and Electric Light Commission has issued an order approving the electric power and cooking rates of the Reading municipal lighting plant, but dismissing that portion of the petition of the municipal light board which asked for authority to sell energy at 2 cents per kw-hr. to the town water department for pumping purposes. The petition asked the commission to consent to the maintenance of certain prices alleged to be less than cost as defined in Acts of 1914, Sec. 115, Chap. 742. The motor-service prices range from 8 cents for 200 kw-hr. or less per month to 2.5 cents for more than 10,000 kw-hr., and the cooking and heating rate alleged to be less than cost is 3.6 cents net. A special 2-cent rate has been in force for the local water department.

Missouri Commission

Official announcement has been made that an injunction will be asked by the Springfield (Mo.) Gas & Electric Company to restrain the Missouri commission from enforcing its decision lowering electrical rates.

New Jersey Commission

The Board of Public Utility Commissioners has dismissed the petition filed against the Public Service Railway Company to compel it to extend its system from Plainfield to South Plainfield. The board holds that present conditions would not justify the construction of this line, estimated to cost between $75,000 and $100,000, and that the probable return in revenue would not warrant the expense involved.

New York Commissions

At the continued hearing before the New York Public Service Commission, Second District, on Oct. 21, in relation to the valuation of the New York Telephone Company, Mr. John L. Swayze, attorney for the company, filed a valuation of property assets as follows:

Telephone plant, $67,131,689; less proportion of total replacement reserves, $11,438,380; balance, $55,693,309; construction in progress, $1,076,073; total, $56,769,382.

Tangibles: Reproduction of physical plant, 20 per cent of $55,693,309; appreciation of real estate, cost of reproduction of Brooklyn subways, 15 per cent right-of-way, etc., $11,138,662.

Intangibles: Special franchise, 1913, New York City, $38,878,949; going-concern value, at least $13,400,000; investment in securities of Empire City Subway Company, $11,794,000; working capital, supplies, $5,250,000; accounts receivable, cash, $137,352,044.

Earnings: Telephone business, eight months, 1914, actual, $6,396,400; earnings, four months, estimated, $3,198,200; total, $9,594,600; estimated earnings Empire City Subway securities, $690,320; total, $10,284,920; net earnings on investment, 7.5 per cent.

Current News Notes

EXHIBIT OF ELECTRIC CARS IN BOSTON.—The second electric automobile salon under the auspices of the Electric Motor Car Club of Boston will be held in the grand ballroom of the Copley Plaza Hotel in Boston from Monday to Friday, Nov. 2 to 6, inclusive. The grand ballroom will be beautifully decorated for this exhibit of pleasure cars. Six manufacturers of electric cars will have exhibits and four manufacturers of batteries and charging apparatus.

* * *

SOCIETY MEETINGS

SUPPLY JOBBERS' CONVENTION.—The Electrical Supply Jobbers' Association will hold its next convention at Birmingham, Ala., Dec. 8, 9 and 10. The headquarters will be at the Tutwiler Hotel. The general secretary of the society is Mr. Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

* * *

NEW OFFICERS OF ELECTRICAL LEAGUE OF CLEVELAND.—At the sixth annual meeting of the Electrical League of Cleveland, held at the Hollenden House on Oct. 22, the following officers were elected: President, Mr. George S. Milner, Erner Electric Company; first vice-president, Mr. M. H. Moffett, National Carbon Company; second vice-president, Mr. H. S. Greene, Nungesser Carbon & Battery Company; third vice-president, Mr. N. H. Boynton, National Lamp Works; fourth vice-president, Mr. Aitken, George Worthington Company; secretary, Mr. R. G. Paite, Cleveland Telephone Company; treasurer, Mr. H. C. Mohr, Cleveland Electric Illuminating Company.

* * *

PITTSBURGH MEETING OF A. I. E. E.—At the regular monthly meeting of the Pittsburgh Section of the American Institute of Electrical Engineers held Wednesday evening, Oct. 21, in the rooms of the Engineers' Society of Western Pennsylvania, Mr. C. B. Auel, director of standards, processes and materials of the Westinghouse Electric & Manufacturing Company, gave an illustrated talk on electric welding. The meeting was largely attended, especially by railroad men, a number of whom participated in the discussion, bringing out many points in the practical operation of electric welding.

* * *

MEETING OF PHILADELPHIA COMPANY SECTION, N. E. L. A.—The Philadelphia Company Section of the National Electric Light Association held its first fall meeting on Oct. 23, 1914. About 375 members were in attendance. Mr. Frank A. Birch, the section's newly elected chairman, presided. Following a vaudeville program in which the section's new band, the "Edison Concert Band of Philadelphia," took part, Mr. Joseph B. McCall, president of the Philadelphia Electric Company, made a brief informal address. Mr. William C. L. Eglin, second vice-president of the company, in a very neat and appropriate speech, presented the Doherty gold medal to Mr. Harold Goodwin, the winner. A telegram was sent to Mr. Thomas Edison congratulating him upon the thirty-fifth anniversary of the invention of the electric lamp. Four brief papers were presented by Messrs. A. F. Mayers, of the meter department; R. A. Huebner, of the accounting department; John Meyer, of the commercial department, and D. F. Schick, of the engineering department. Each touched briefly upon the work of his respective department and showed the manner in which the work in each dovetailed with that in the others.

The Goldschmidt Transatlantic Radio Station

Description of the plant at Tuckerton, N. J., which receives sustained waves from Eilvese, Germany, 4000 miles away. By John L. Hogan, Jr.

THE sustained-wave wireless station at Tuckerton, just north of Atlantic City, is again becoming a center of interest by reason of the recent reopening of radio service from there direct to Eilvese, near Hanover, Germany. It will be remembered that this plant had been in experimental operation for some months prior to the beginning of the European war, and that communication between the United States and Germany had been secured both by day and by night. Further trials, to determine the possibility of continuous exchange of messages through periods of severe atmospheric interference and to determine the reliability of operation, were anticipated, and it was proposed later to compete with cable transmission to Germany. When the Emden cable was cut direct signaling to Germany could be effected only by the radio stations at Tuckerton and Sayville, and of these the higher-powered Tuckerton plant proved the more useful. A number of messages were sent through, when a complication in the matter of federal license for the station (which is foreign-owned) arose. To expedite the useful end of what promised to become a snarl of legal technicalities, the United States Navy Department took over the operation of the Goldschmidt outfit and, beginning Sept. 9, accepted from the public "neutral" messages for transmission to Eilvese and other shore stations in Europe.

Under naval supervision a station rate of 17 cents per word (with ten-word-per-message minimum) was fixed, and a set of elaborate regulations concerning the censorship of coded messages was formulated. On Sept. 15 it was announced that communication with Eilvese could be had through the prevailing heavy static for only about three hours each night, and that therefore the station word rate would be increased to 25 cents and a maximum length of 25 words set for any one message. The requirement of ten words minimum was withdrawn. Operation upon this basis was begun, but during the night-sending schedule of Sept. 15-16 the radio-frequency alternator became damaged and the station was forced to close. A duplicate machine was immediately ordered from Germany, to be shipped by way of Rotterdam, and it is hoped that the new alternator will pass quickly through neutral territory. In the meanwhile apparatus from California has been installed to re-establish communication.

The Goldschmidt installations here and in Germany are essentially duplicates and form the first pair of radio stations erected to intercommunicate over such great distances by means of machine-generated sustained waves. The "reflection alternator," within which alternating currents having a fundamental frequency of the order of 10,000 are efficiently quadrupled in frequency, is the basis of each installation. The Tuckerton machine is shown in Fig. 1, in which can be seen the heavy main radio-frequency conductors and the banks of mica-dielectric condensers used for tuning to the sub-frequencies of approximately 10,000, 20,000 and

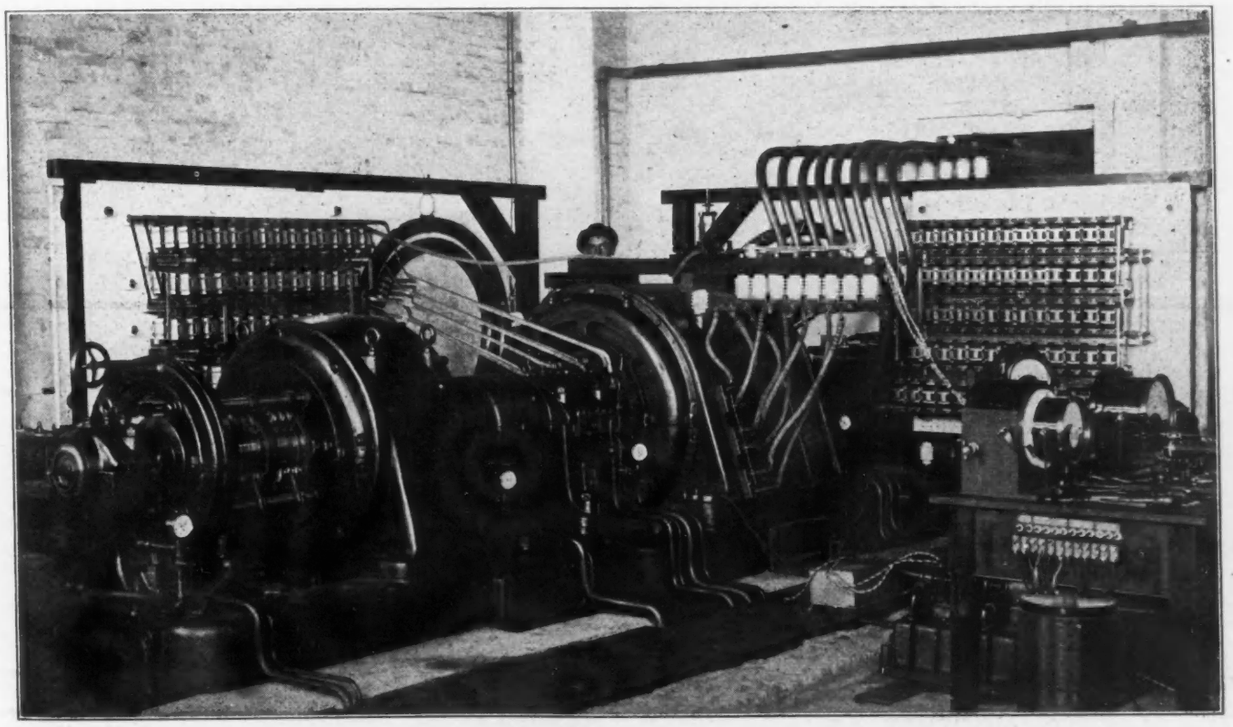


FIG. 1—GOLDSCHMIDT 100-KW RADIO-FREQUENCY ALTERNATOR

30,000 cycles per second. The Tuckerton plant has a complete steam-power equipment comprising a Westinghouse double compound vertical engine belted to two Triumph 120-hp, 220-volt direct-current generators, which, through line-voltage control, operate the main driving motor. This machine is of 250-hp rating, and,

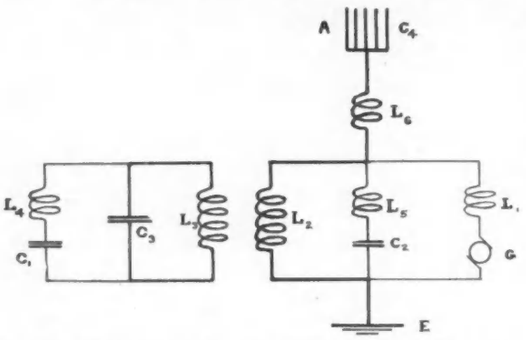


FIG. 2—ARRANGEMENT OF FOUR-STEP MACHINE

as shown, is coupled directly to the radio-frequency alternator.

The alternator and its motor are of German construction and are considered remarkable electrically and mechanically. The generator is of especially rigid design, since in it there are some 300 poles surrounding a rotor about 3 ft. in diameter, both rotor and stator being constructed of steel laminations 2 mils in thickness separated by 1.2-mil paper. The rotor weighs approximately 5 tons. The machine runs at 4000 r.p.m. with an air-gap of less than 1 mm. These unusual conditions, among others equally difficult to meet, are forced upon the builder by the requirements of high fundamental frequency and minimum leakage in the magnetic paths. The details of the method of frequency transformation effective in the machine have been given in other papers,[1] and it will be sufficient herein to indicate and explain the circuits used in the four-step machine, as in Fig. 2. Direct current from the exciting generator G is led through the choke coil L_1 and the stator windings L_2, and in the usual way sets up a current having a frequency of 10,000 cycles per second in the rotor L_3 and associated condenser C_1 and inductance L_4, which series of elements is tuned to this frequency. By reaction the 10,000-cycle current reinduces 20,000 cycles per second in the stator, this double-frequency current flowing through the tuned circuit L_2, L_5, C_2, and in turn creating a triple frequency of 30,000 in the rotor. The circuit L_5, C_2 is tuned to this rate of alternation, and its current sets up in the stator the resultant desired 40,000-cycle current, which is applied to the resonant antenna-to-earth circuit C_4, L_6, L_2, E. At Tuckerton the aerial radio-frequency current is some 135 amp, which, since the antenna resistance is about 6 ohms at 7400 m wave-length, represents about 110 kw in the aerial. This is produced with a power expenditure in the driving motor of approximately 180 kw, indicating an efficiency of 60 per cent. It is stated that the machine is capable of generating as much as 200 kw of radio-frequency power.

Fig. 3 is a general view of the Tuckerton plant. The single triangular-section steel tower is 825 ft. high and supported by twelve guys in sets of three. Fig. 4 shows the glass-insulated base of the tower, which includes a universal joint to permit slight tilting of the structure under heavy wind stresses. A second insulated joint is placed half-way up the tower, to give additional flexibility and to prevent the formation of large currents by induction. The steel-cable guys are also subdivided by insulators. The "double-cone" aerial system consists of a group of thirty-six wires insulated from the tower and extending umbrella-wise from its top for about 600 ft. and then dropping to the tower base, where they enter the station building. The natural frequency of the aerial is about 107,000 cycles per second, corresponding to a wave-length of 2800 m, or approximately two and seven-tenths times the operating frequency of the generator.

In sending Morse signals with the Goldschmidt transmitter the radio-frequency power is shut off or materially reduced from full value during the "space" interval between dots and dashes by connecting the key in the exciting direct-current supply. Thus the motor load is rapidly thrown on and off, and since the relative times for which the key is down and up change according to the succession of dots and dashes, the resultant load on the motor varies from second to second. Such changes if not compensated would, of course, cause the motor-generator speed to fluctuate, and the antenna current would become less as the machine drifted away from the resonant frequency. To secure constancy of tuning and wave-length, therefore, it has been found necessary to place in the key or Morse relay circuit a part of the motor-field resistance, so connecting it that as the key is depressed and the load thrown on the motor field is weakened just enough to overcome the tendency to slow down. It should be noted that in sending by opening and closing the exciting circuit the entire output of 100 kw or so may be controlled by relays carrying only some 5 kw or 6 kw, and that, because of the highly laminated magnetic circuits of the machine, the antenna current changes are abrupt enough to permit rapid telegraphing.

The Tuckerton station receives sustained waves sent from Eilvese, 4000 miles away, by use of the usual tuning circuits and a detecting or converting device called the tone wheel.[2] This instrument, which is shown in

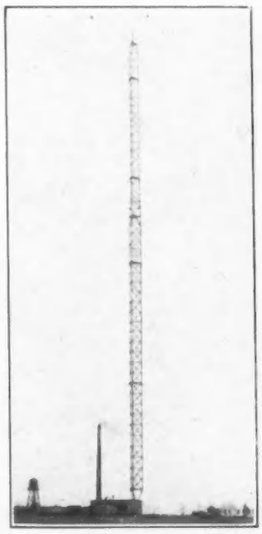


FIG. 3—GENERAL VIEW OF PLANT AT TUCKERTON

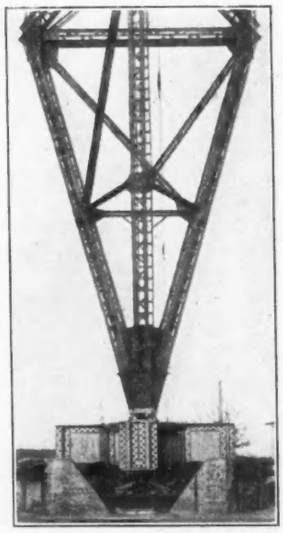


FIG. 4—INSULATED BASE OF TOWER

Fig. 6, consists of a toothed wheel mounted on the shaft of a special high-speed motor and having a contact brush running on its edge, the whole forming an inter-

[1]The theory and further details as to the construction of the Goldschmidt machine may be found in: *Proceedings*, Institute of Radio Engineers, Vol. II, No. 1, March, 1914, page 69, Mayer: London *Electrician*, Feb. 17, 1911, page 744; July 19, 1912, page 615, and May 16, 1913, page 219, and *Lehrbuch der Drahtlosen Telegraphie*, Zenneck, 1913, pages 255-259.

[2]For further details of the tone wheel, see *Proceedings*, Institute of Radio Engineers, March, 1914, and *Jahrbuch der Drahtlosen Telegraphie und Telephonie*, June, 1914, pages 516-524.

rupter of high and controllable frequency. As may be seen from the photograph, the instrument is equipped with a tachometer, an eddy-current brake and a centrifugal-electrical speed-controlling device. When connected in a suitable circuit—for example, at *TW* in the usual tikker or rectifier arrangement of Fig. 5—and rotated

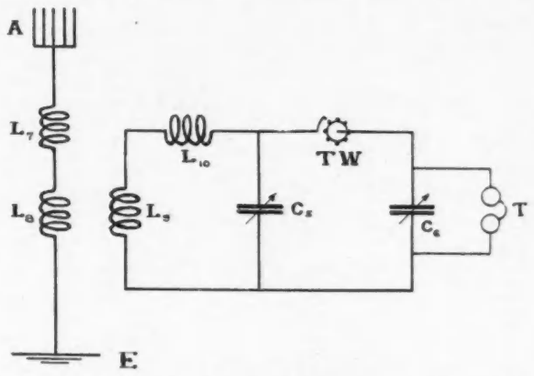


FIG. 5—DIAGRAM OF TONE-WHEEL CONNECTIONS

so that the contacts occur slightly faster or slower than do successive current maxima produced by the received electromagnetic wave, a musical signal tone is given off by the receiving telephones *T*. The pitch of this tone is equal to the difference in the received oscillation frequency and the contact frequency, and may be varied to suit static or other conditions by altering the speed of the tone wheel. The mode of operation may be understood by further consideration of Fig. 5, wherein L_7 and L_8 are used to tune the antenna C_5 to the frequency n_1 of the incoming waves, and L_9, L_{10} and C_5 are the secondary tuning elements arranged for the usual adjustments. When in resonance sustained alternating potentials of maximum value and radio frequency n_1 are set up across condenser C_6. If the tone wheel revolves at the speed giving interruption frequency n_1 (corresponding to one contact per complete cycle of oscillation in the receiving circuit), the condenser C_6 will be charged with a unidirectional voltage of amplitude and polarity determined by the phase relation between the instant of contact and the oscillation cycle. If the tone wheel is driven at a contact frequency n_2, slightly different from n_1, there will be a uniform progression of phase difference between these polarity and amplitude determining factors, and the result will be an alternating charge upon C_6, the cyclic frequency in polarity of which will be measured by the beats between frequencies n_1 and n_2, or, in other words, their numerical difference. Thus, if the wave-length received is 7500 m, having a frequency of 40,000 cycles per second, and the tone wheel is run at 39,500 or at 40,500 contacts per second, the signal note produced will have a pitch corresponding to $n_1 - n_2$, or 500 cycles per second. Since energy is drawn from the secondary circuit at each oscillation, the telephone condenser C_6 must have smaller capacity than is customary with the intermittent-contact tikker, if the selectiveness of the tuning arrangement is not to be destroyed by high equivalent resistance effects. In addition to operation at the fundamental wave frequency, it is possible to secure the production of audible beat tones on speeds of the tone wheel giving contact at rates slightly different from various multiples or submultiples of the received wave frequency, though it is stated that a diminution of signal intensity attends such operation.

Obviously, the tone-wheel method of reception has many of the same properties as the Fessenden heterodyne receiver. For instance, the tone frequency is equal to the numerical difference in frequencies of the received wave and the contactor or local generator, the tone effects may be produced at harmonic frequencies of either, interference may be eliminated by adjusting the local frequency to produce inaudible current frequencies from the interfering waves, sustained wave signals result in clear musical tones while persistent damped wave signals give hissy sounds in the telephones, etc. The receiving circuits actually used at Tuckerton have not been disclosed, but the simple arrangement of Fig. 5 includes no local source of energy and depends upon the mechanical periodic alternate rectification of the incoming wave energy to affect the telephones. Opinion appears to differ as to whether or not this may be considered an equivalent of the heterodyne apparatus which produces the same effects, since the amplification secured with the heterodyne by addition of local energy may not be had with the arrangement illustrated.

The Goldschmidt stations are excellent examples of modern radio engineering as applied to long-distance telegraphing. Signals from Tuckerton have been printed photographically at Eilvese, in daylight transmission, by use of the string galvanometer shadow recorder, and are officially stated to give intensity readings of from 100 to 200 times audibility under normal working conditions. Transmission seems about the same in either direction, though atmospheric difficulties may be somewhat greater at the American end. No data are available as to the degree to which "static" interferes with uniform signaling. It is believed that these plants have approached more nearly than any others the condition permitting commercial radio service directly between the United States and Europe, and the fact that the Tuckerton alternator was mechanically damaged just as a demonstration was begun is a cause of much regret among radio engineers generally. Until the California alternator was installed the station was operated with an arc-type sustained-wave generator which for short periods can be used on some 80 kw to 100 kw input of power and gives an antenna current of about 90 amp, corresponding to nearly 50 kw of radio-frequency power. This permits night-time signaling to Eilvese under favorable conditions. Arrangements were made to install larger apparatus in order to permit continuous sending by the arc method at this or somewhat higher power. In consideration of the 825-ft. antenna height, Tuckerton may give better service than can be

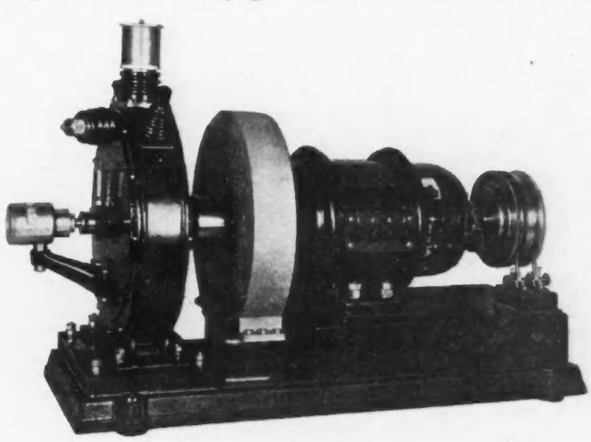


FIG. 6—TONE WHEEL

secured from Sayville's 50-kw spark transmitter even before the new alternator is received.

The final re-establishment of communication in both directions between the Goldschmidt plants will confer a great boon upon all who have been hampered by the difficulties of indirect and censored cable communication with Germany.

The Design of High-Voltage Rectifiers

Description of three completed machines embodying distinct principles and of a proposed fourth apparatus to combine the best features of the others. By H. C. Wolf and H. Mathews

THE study of the phenomena and the applications of high potentials has recently led to a demand for high unidirectional, but not necessarily constant, voltages. Direct-current generators cannot be well enough insulated to produce very good results along this line, and hence rotating rectifiers, which reverse a portion of the alternating wave, have been

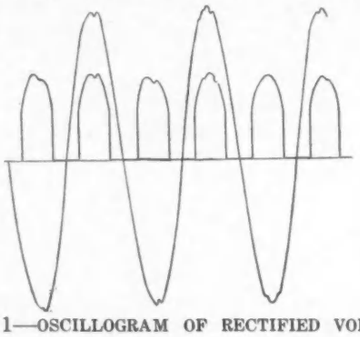


FIG. 1—OSCILLOGRAM OF RECTIFIED VOLTAGE

employed. The most important demands for these high unidirectional voltages have come from physicists for use in a study of Roentgen rays and from experimenters with electrical precipitation processes.

A rectifier can be made to take off only a portion of the wave. It is driven by a motor running in synchronism with the exciting circuit current, thus causing all the loops to be identical. For most effective results the maximum portion of the wave should be included in the part rectified, not only to give the greatest amount of power for the same voltage, but also to prevent an alternating voltage being obtained on the rectified side by rectifying the portion which crosses the axis. The cost of construction and maintenance and the insulation of rectifiers are the two deciding factors in their design. Three different rectifiers, each embodying distinct principles and each governed in a greater or less degree by the above factors, were built and tested by the writers, while a fourth, containing the best features of these three, has been proposed.

For obtaining high alternating voltage use was made of a 100-kw, sixty-cycle, 500, 1000 or 2000 to 200,000-volt transformer excited from a 440-volt source. From an auxiliary low-voltage winding effective secondary voltages were read and oscillograms were taken directly. The maximum value of the voltage was either computed from an analysis of the wave or ascertained by the use of a sphere gap. Oscillograms were taken also on the rectified side, and the maximum point of voltage was obtained as before. A 10-hp, 440-volt, four-pole synchronous motor was used to drive the rectifiers, but a 5-hp motor would have been large enough.

The first rectifier constructed was of the disk, contact type, its design being entirely original with the writers. Two 12.5-in. wooden disks were mounted parallel on a wooden shaft 11 in. apart. On the periphery of each disk were two electrically connected brass segments at right angles to those on the opposite disk, 180 mechanical degrees apart, and each spanning 45 mechanical degrees so as to rectify 90 deg. of the wave. Alternating voltage was received from two slip-rings, one attached to the segments on each disk, while the rectified voltage was taken off by two sets of two wire brushes each bearing on the periphery of the disks. These two sets were 90 mechanical degrees apart, and brushes in the same plane on opposite disks were of the same polarity, hence electrically connected. The brushes were set to take off 90 deg. from the maximum portion of the wave, which effect is shown by the oscillogram of Fig. 1, and by actual measurements. This oscillogram was taken at a maximum voltage of 368 volts, measured on the alternating side, and by analysis it shows the effective value of the rectified wave to be 0.63 of the maximum and the average value to be 0.45 of the same value. An induction-type voltmeter registered 240 volts at the same time that a permanent field meter read 170 volts, both values checking closely with the wave analysis. The similarity between the alternating and rectified voltages is noticeable, the one being simply the reproduction of the other. The advantage of this type of rectifier lies chiefly in the fact that its action can be studied and all adjustments made at low voltages. It was possible to rectify only 65,000 volts, maximum value, for at this value flash-over occurred around the periphery of the disks.

The second rectifier is shown in Fig. 2. It is somewhat similar to one used by the Research Corporation

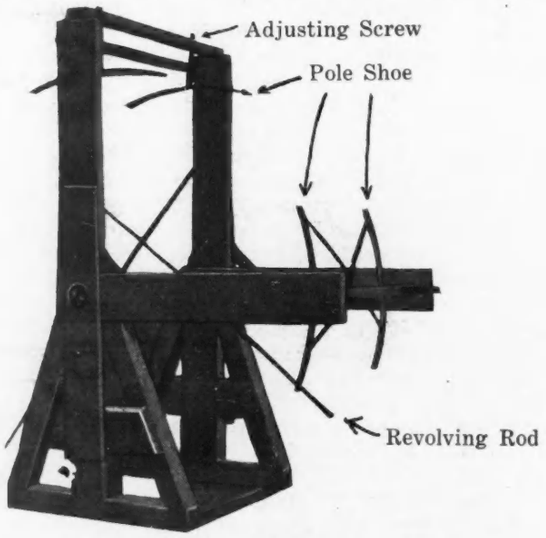


FIG. 2—RECTIFIER OF REVOLVING RODS

of New York in work on the electrical precipitation of suspended particles. Since it is difficult to construct well-insulated and at the same time well-balanced wooden disks, the idea was conceived of substituting for these brass rods set at right angles, and of governing the length of the rectified wave by stationary instead of revolving brass segments. These rods were 30 in. long and each pair was spaced 12 in. along a

wooden shaft. Alternating voltage was received through slip-rings as before, while the rectified voltage was taken from the stationary pole shoes. The clearance between the revolving rods and the shoes could be adjusted by means of a set screw shown at the top of the frame. Looking at Fig. 2 and assuming that the rod is positive when in a vertical position, it

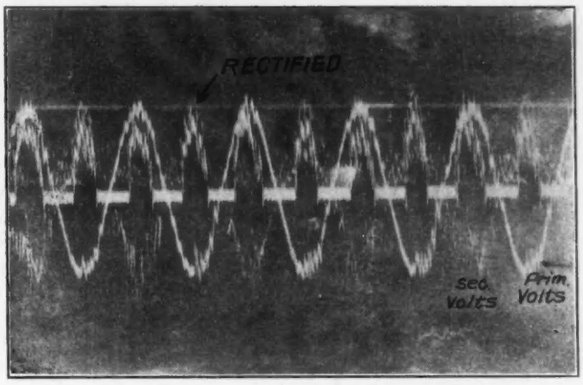


FIG. 3—OSCILLOGRAM OF RECTIFIED VOLTAGE

is seen that it will be negative one-fourth of a revolution later when in a horizontal position. Thus one pair of the pole shoes is positive while the other is negative, as the other rods are going through the same process as the one referred to. The air-gaps in the circuit and the capacity and inductance of the system produce high-frequency currents, thereby rendering a wave analysis extremely difficult. Fig. 3 is an oscillogram taken at a maximum emf of 55,000 volts, showing the primary and secondary voltages of the transformer and the rectified voltage. Several other waves are noticeable, but they are not pertinent to this discussion. The high-frequency oscillations are seen to be carried back into the primary, thus indicating the strain thrown on the entire system in high-potential testing. For taking this oscillogram the rectified voltage was impressed on a resistor of high resistance which was grounded at its mid-point, and the oscillograph element was placed in the ground connection. The auxiliary winding on the transformer was used for obtaining the alternating wave. With this type of rectifier any emf from 15,000 volts to 110,000 volts maximum value could be rectified; it possesses advantages of lightness and compactness.

In the third rectifier use was also made of wooden disks. These were of seasoned poplar, 18 in. in diameter and 1.5 in. thick, spaced 14 in. along a 4-in. wooden shaft. Equally distributed about the periphery of each disk were four brass segments of such length as to rectify about 64 deg. of the wave. Two opposite segments on each disk were electrically connected, while the alternate segments were connected to the segments on the opposite sides of the other disks. Alternating voltage was conveyed to these segments from brass discharge points mounted on the tops of wooden posts, one set of points in each line, and so constructed that the clearance between the points and the revolving segments could be varied. Two similar sets of points on opposite sides of the disks collected the rectified voltage. Fig. 4 gives a view of this rectifier showing the disks and a portion of the segments and connectors, the discharge and collecting points, the shaft and bearing, and a portion of the driving motor. The advantage of this type of rectifier lies in the fact that its connections are so made that electrical break-down must occur either around one-half the periphery of the disks or between discharge points of opposite polarity, and thus a machine of the same dimensions as the previous types could be worked at much higher voltages. A maximum emf of 180,000 was attained in practice before breakdown occurred. The great weight of the revolving parts and their liability to become unbalanced are, however, objections which may outweigh the increased insulating value.

A combination of the last two types with a possible provision for obtaining actual brush contact would seem to be the best solution of the problem. A machine fulfilling these provisions would have stationary pole shoes in place of the discharge and collecting points used in the last type, while the brass rods of the second type would be replaced by insulating rods with brass tips. One of these rods on either end should be hollow to allow of the connection between the tips, while the other tips should be interconnected similarly to the segments in the third type, by rubber-incased wires. Balancing weights would probably be required to offset the effect of these latter connections. Suitable bearings and supports must be provided and the whole machine well insulated from the ground. A rectifier of this type, using 30-in. rods spaced 18 in. along the shaft and with pole shoes long enough to rectify 90 deg. of the wave, should withstand 300,000 volts, maximum value.

The simplest method of making adjustments for securing the best portion of the wave seems to be to change the relative position of the revolving parts of the motor and of the rectifier by means of an adjustable coupling between the two. Several methods of finding the best position of the parts are possible, the most accurate being by means of an oscillogram of the rectified and alternating waves. The rectified voltage may also be impressed on a resistor of high resistance and the current read either on the rectified or on the alternating side. The best position is attained with the maximum current. Another method applicable to those rectifiers which do not have actual contact between their brushes and revolving parts is to observe the condition of the sparks as the points pass under the pole shoes, when the rectified brushes are short-circuited. A definite spark, plainly noticeable in a dark room, occurs at the peak of each oscillation, being brighter the higher the peak. Thus the brightest point will occur at the maximum value of voltage, and by making adjustments until this point comes at the center of the pole shoe the best portion of the wave will be secured. A brighter spot on the end where the brush leaves the pole shoe indicates that the brushes should be set back, while a

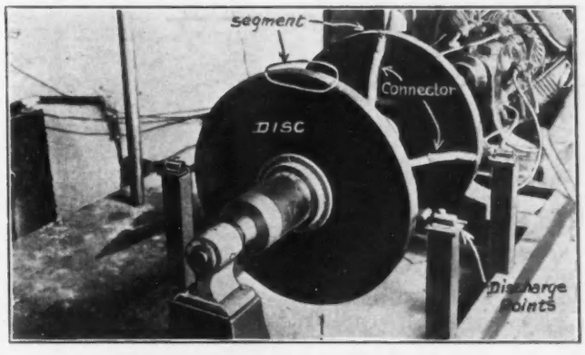


FIG. 4—REVOLVING-DISK RECTIFIER

bright spot on the approaching side indicates a lag in the brushes.

There are many considerations which enter into the design and use of high-voltage rectifiers, and it will probably be a great while before manufacturers are making a satisfactory standard rectifier, but there is no reason to believe that a good machine cannot be built in any modern experimenter's shop.

Hydroelectric Development on Bishop Creek, Cal.—III

Intake reservoir of station No. 2—Detailed description of the wood-stave flow line and the steel pressure line—How a broken casting was repaired. By C. O. Poole

THE flood-water line of Plant No. 2 intake reservoir will be on a level with the tailrace of Plant No. 1. This intake reservoir has a capacity of 600 acre-ft. and serves as an equalizing reservoir for the whole system of plants. The dam is earth-fill, with concrete core wall and rubble-concrete spillway, 40 ft. in width. There are two 36-in. sluice ports through the spill section that serve to sluice out any accumulation of sediment carried into the reservoir. Fig. 17 is a view of the dam and reservoir, with the Sierras in the background. Fig. 18 is a plan and section of the dam. The elevation of this intake is 8028 ft. The intake chamber for the flow line is situated within the reservoir and is of reinforced concrete, having openings on two sides, covered with inclined screens consisting of ¼-in. by 3-in. steel bars on edge, spaced on 1-in. centers. The control of the water to this box is by means of four wooden gates 36 in. wide by 96 in. high.

The reservoir is on the Middle Fork of the stream, and the water from the South Fork is brought to it by means of a steel pipe laid in the form of an inverted siphon. This pipe is 8140 ft. in length, the upstream half being 38 in. in diameter and the lower half being 34 in. in diameter. The South Fork is diverted by means of a small crib dam, rock-filled. The entrance to the pipe is screened and controlled by wooden gates. The elevation of this intake is 112 ft. above the intake to station No. 2. The lowest point of the siphon is 158 ft. below the South Fork intake, and at that point a 16-in. gate valve is installed for the purpose of drawing out sediment. The line passes over the point of a hill about midway in the line, from which point the pipe has a uniform drop of 14 ft. per 1000 ft. On the high point of the pipe there is provided a float air vent having a 2-in. valve to relieve the siphon of air accumulations. There is also a 6-in. drop air valve at that point to admit air to prevent the pipe collapsing.

Flow Line, Station No. 2

A 48-in. steel pipe leads through the intake dam and connects with a 48-in. wood-stave flow line laid on a uniform grade of 4 ft. per 1000 ft. This grade, together with the head in the intake reservoir, gives a carrying capacity of 135 second-ft. The wood pipe is 10,035 ft. in length and the grade is on a hillside the whole distance. Curves as short as 40 diameters are made with the staves, while curves of less radius are made with steel angle pieces, as shown in Fig. 19. These steel angle pieces are made smooth on the outside for a distance of 2 ft. on either end by using a butt strap on the inside and countersinking the rivets on the outside. The outside diameter of these angles is the same as the inside diameter of the wood pipe. The wood pipe is then built around the steel pieces, and the wood stave bands are used to make the joint tight. This has proved very satisfactory, joints thus made having been used under a head of 100 ft. for several years.

The staves are of selected redwood, and ½-in. steel bands are spaced to give a factor of safety of four, based on an ultimate strength in the steel of 60,000 lb. per square inch. Steel dowels, ⅛ in. by 1½ in., are used to join ends of staves. The flow line terminates in a steel standpine fitting, the standpipe being 48 in. in diameter and 80 ft. in height. It is composed of ¼-in. steel in the lower half and 3/16-in. steel in the upper half and is firmly guyed with eight steel cables, four at the top and four at the middle joint. The standpipe is installed on a narrow ridge, from which point a steep descent is made to the station.

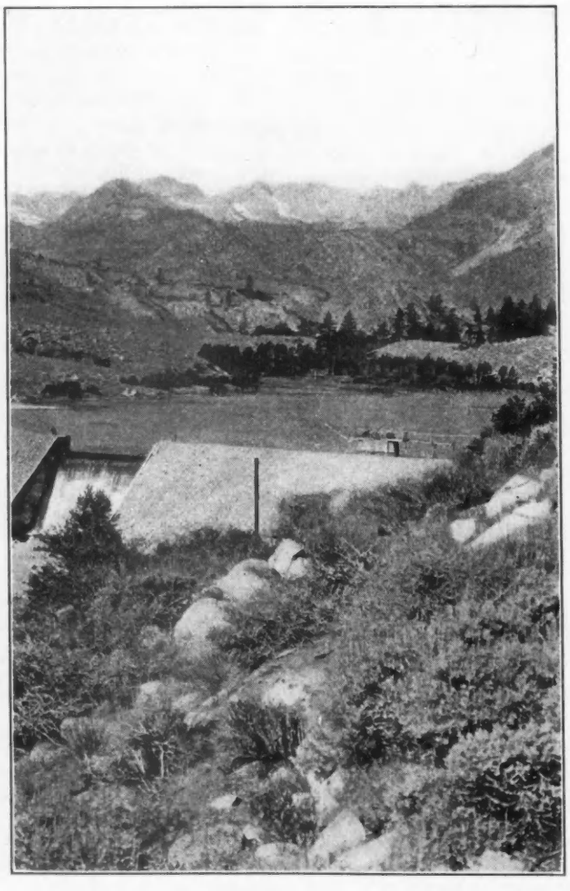


FIG. 17—DAM AND RESERVOIR FOR STATION NO. 2

Pressure Line

The steel pressure line commences at the standpipe, where it connects with a 48-in. cast-iron gate having a 6-in. pass. Directly below this gate in the steel pipe is a manhole providing means of access. This has been found very convenient on one occasion at least, as shown later. The pipe has a total length of 2646 ft. and a uniform inside diameter of 48 in. The metal varies in thickness from ¼ in. to ⅞ in., the upper half being riveted lap joint and the lower half butt straps, triple-riveted. Fig. 20 shows the system of riveting. The pipe has a factor of safety of four, based on ultimate strength in the steel of 55,000 lb. per square inch, using joint efficiency of 72 per cent in the lap-riveted and 85 per cent in the butt-strap sections. The sections were all riveted and calked in the shop and

shipped in 24-ft. lengths. The holes in the joining ends were punched ⅛ in. small in the shop and reamed out to size after joining in the trench, air tools being used in all field work.

The cost of the steel pipe, including all handling, trench and field work, was 8 cents per lb. The pipe was laid in a trench from 4 ft. to 5 ft. in depth and anchored in place by heavy concrete piers placed about 300 ft. apart. There were a number of angles in the pipe, and it was designed in the shop to fit the grade of the trench. The method of obtaining the measurements for the pipe was to grade the trench carefully to stakes set in the bottom of the trench, the tops being flush with the grade and care being exercised to have a station at each angle, either horizontal or vertical. A transit line was then run over the tack centers of the stakes in the center of the trench. At each angle the horizontal angle was read, then the vertical angle, and the exact distance along the bottom of trench was measured between angle points. Where a vertical and horizontal angle occurred at the same point, a resultant angle was worked out for the pipe manufacturer. For this purpose a formula was developed as follows:

A = vertical angle of one pipe.
B = vertical angle of the other pipe.
C = horizontal angle between pipes.
X = pipe angle.

Then $\cos X = (\sin A \times \sin B) + (\cos A \times \cos B \times \cos C)$.

The pressure pipe terminates in a steel manifold at the generating station, where three 24-in. branch pipes are taken off and a 12-in. relief pipe extends in line with the main pipe. This arrangement is shown in Fig. 20. The reducing Y's are of cast steel, the thickness of the metal being 1½ in. with heavy ribs on the outside for reinforcing. It may be of interest to state here that the largest Y, reducing from 48-in. diameter to 40-in. diameter, with 24-in. branch, after being constantly used for five years, without any unusual conditions of operation, failed by opening up a crack ⅛ in. wide extending throughout the 40-in. and 24-in. flanges and through the crotch of the branch. The station was flooded, but the operator succeeded in disconnecting the generators from the system and cutting out the fields before the water filled the pits, so no particular damage was done to the apparatus inside the station. A description of the break and repairs is given below.

The broken casting was supposed to be of the best quality cast steel that could be obtained at the time it was made, but the use of cast steel in such forms in 1908 was apparently not far enough advanced to secure absolutely uniform texture of metal throughout the forms of the casting.

The size of the casting was 7 ft. in length over the flanges in the main section, one end having a diameter of 48 in. inside and the other having a diameter of 40 in. inside, the upper end being provided with a flange 3 in. thick, with a total outside diameter of 62½ in., the 40-in. section having a flange of 2½ in. thickness and outside diameter of 53 in. There was a 24-in. branch taken off at a 30-deg. angle, flange 1¼ in. thick, outside diameter 35 in.

The metal in the body of the casting in both branches was about 1½ in. thick. The forks were heavily ribbed with 1½-in. ribs, the whole piece being cast integral, flanges and all.

The failure in this steel Y-piece was undoubtedly primarily caused by a shrinkage strain or poor metal in the casting, as there was nothing unusual in the operation of the system at the time the accident happened.

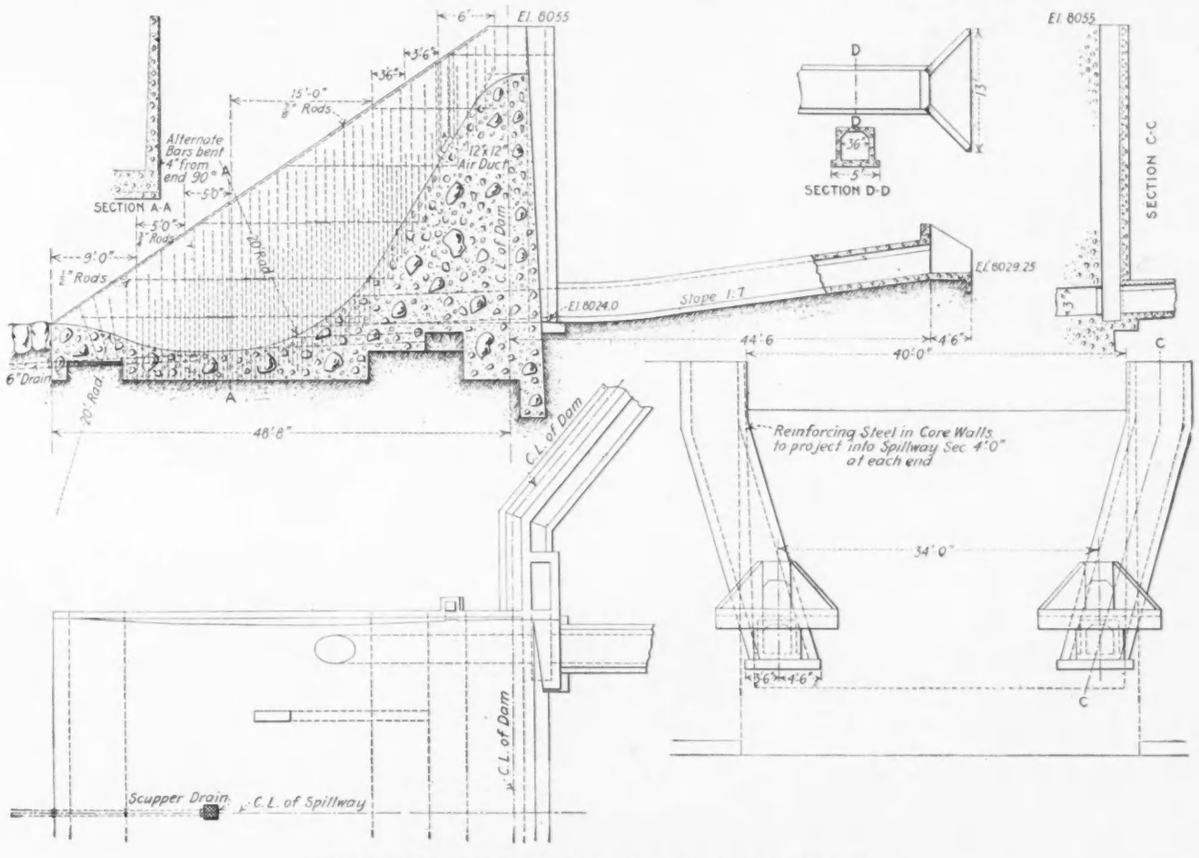


FIG. 18—PLAN AND SECTION OF DAM FOR STATION NO. 2

Some of the operators at station No. 2 had on two or three different instances heard a kind of cracking noise outside the generating station but could not find any reason for the noise until the pipe finally gave way. It is possible that this crack has been forming for some

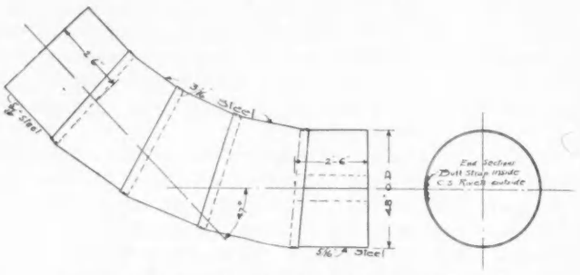


FIG. 19—STEEL BAND FOR WOOD-STAVE PIPE

time and finally gave way on Nov. 7, 1913. The station was flooded and all of the grounds around the building washed out, in addition to part of the road for a distance of about 300 ft. below the plant. There was about 6 in. of water on the floor of the station, and naturally the lower half of the generators were soaked with water. By energetic work the generators were put into service again a few days later.

Owing to the massive construction of the Y-piece and the peculiarly wedged position of the casting it was impossible to take it out without first cutting the ¾-in. butt strap through and cutting off eighty 1-in. rivets and wedging the half-steel flange on the section of pipe below the Y far enough away from the steel casting to give it clearance, so that it could be removed for repairs. This was a very tedious and hard job and had to be done by hand. The men worked night and day cutting rivets and drilling them out, etc., by hand, at the same time straining every effort to install the compressor plant, which had to be moved from station No. 3, so that air tools could be used to expedite the work. The compressor went into service on Nov. 14 and the rivets were all cut that night. The Y was then hoisted out of the trench and blocked up ready for putting it in the power house.

After the accident the writer went immediately from Riverside to Los Angeles and considered with the Baker Iron Works the best way to repair the casting. In order to be prepared for any emergency and to save time, shrink rings, special clamps, etc., were ordered shipped in by express, and the Schaw-Batcher Company, at San Francisco, was ordered to send two good pipe men, while arrangements were made with the Pelton Water Wheel Company, of San Francisco, to send an electric welder.

Fig. 21 (a) is a view of the casting hoisted up from the trench ready to put into the power house. Inside the station the casting was placed under the crane, where it could be handled to good advantage, and work was started immediately in chipping out the casting along the cracks of the two branches of the Y. By referring to Fig. 21 (b and c) a good idea of the nature of the fracture can be obtained. The pictures were taken looking into the 40-in. end of the Y and show the 24-in. branch to the right. As will be seen, the crack extended through the 40-in. flange and into the crotch of the Y, a distance of about 30 in. to the point of the crotch; thence through the 24-in. branch, including the flange of

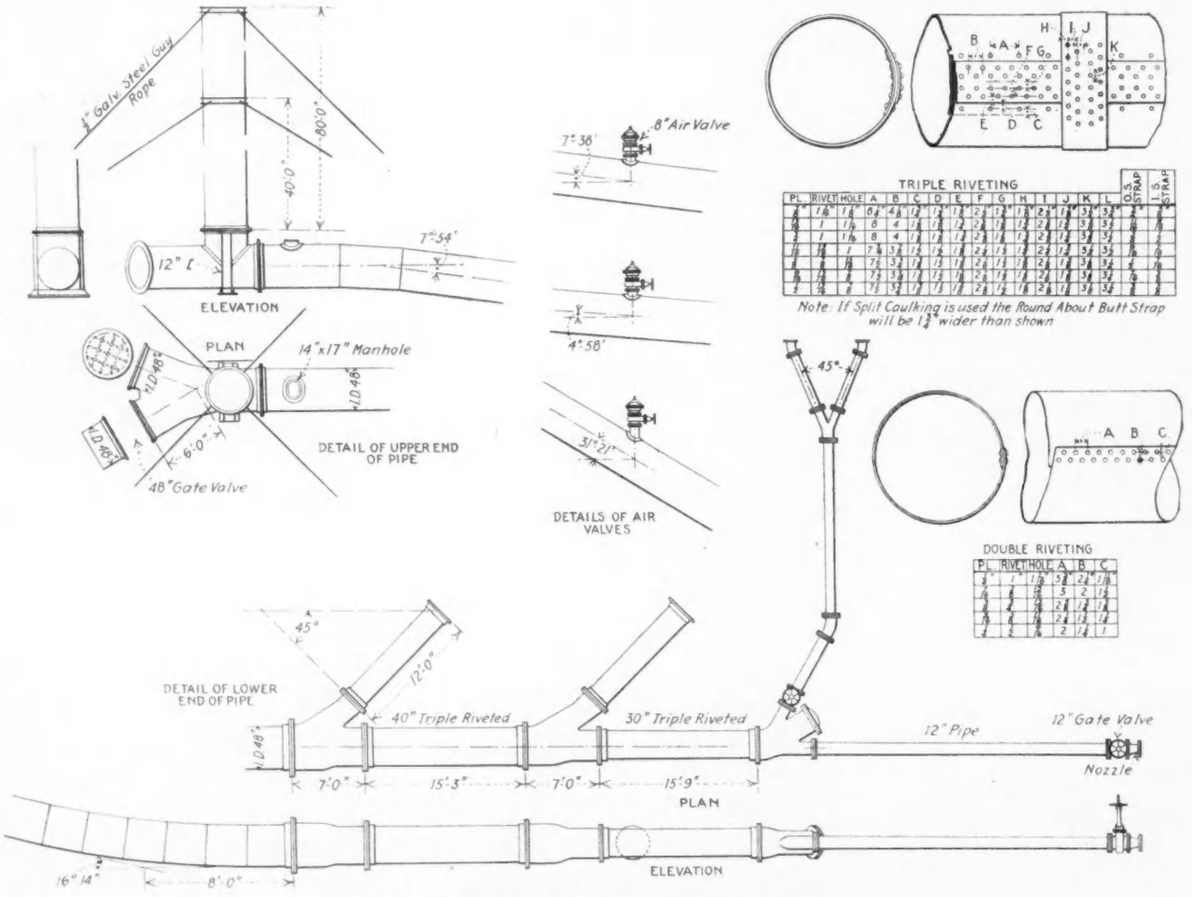
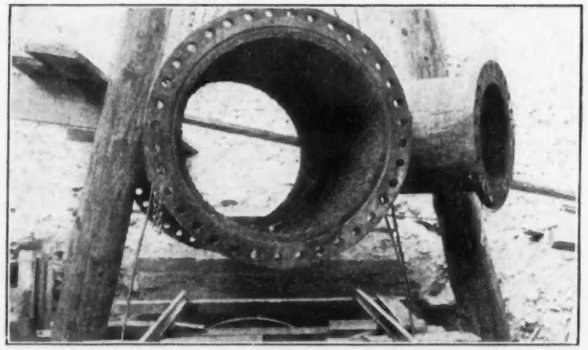
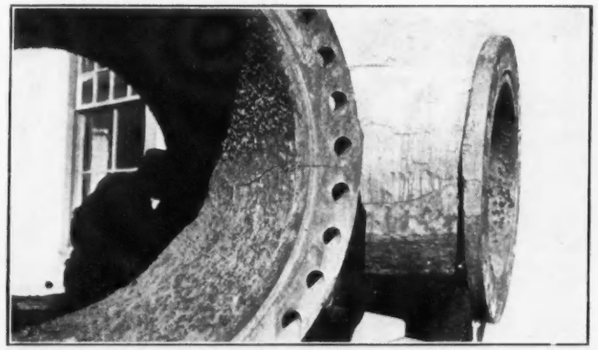


FIG. 20—DETAILS OF STEEL PRESSURE PIPE

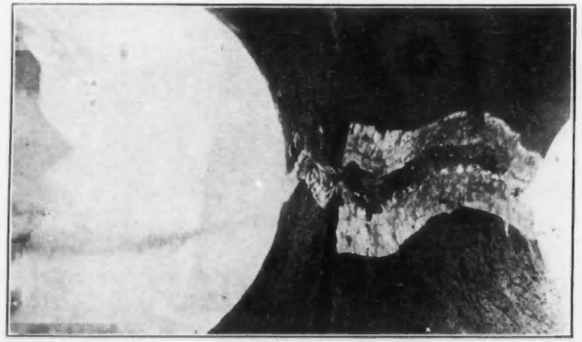


A—CASTING RAISED FROM TRENCH

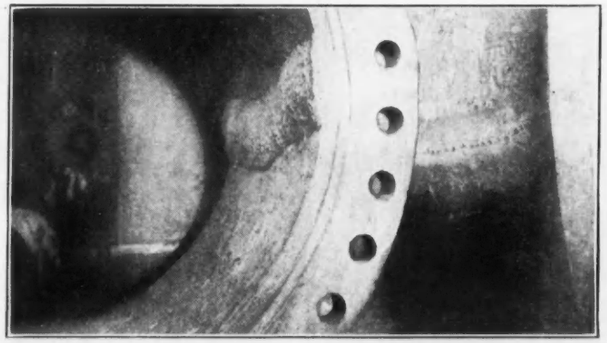


B—VIEW OF FRACTURE

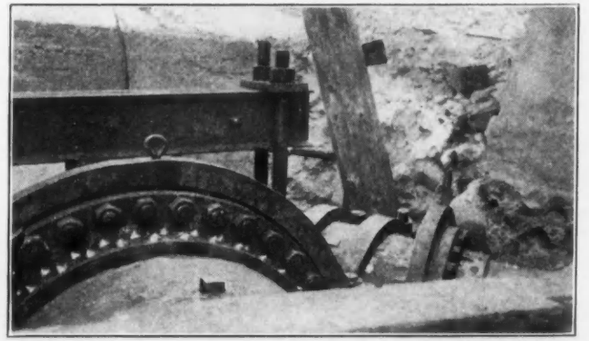
C—ANOTHER VIEW OF FRACTURE



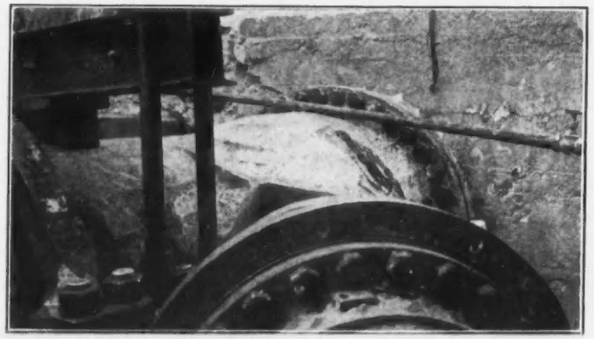
D—THE CHIPPING BEFORE WELDING



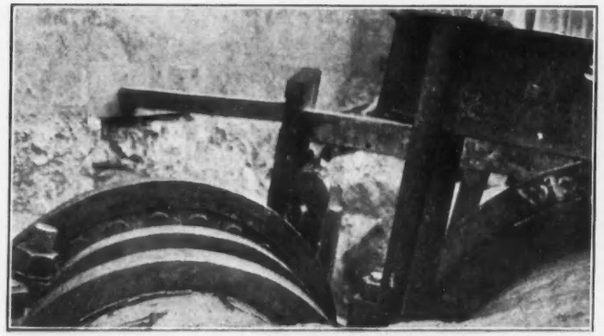
E—THE WELD FINISHED



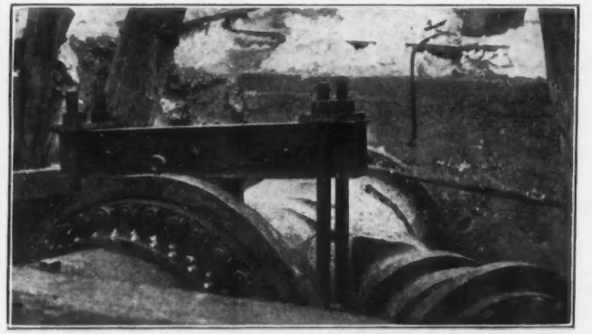
F—VIEW OF THE CLAMPS USED



G—VIEW OF STEEL CLAMPS



H—VIEW OF STEEL CLAMPS



I—VIEW OF STEEL CLAMPS

FIG. 21—VIEWS OF FRACTURED CASTING AND ITS REPAIR

same, a distance from the crotch to the end of the 24-in. flange of about 37 in. The opening in the crack through the metal was about ⅛ in.

With the tools at hand the cracks were chipped in the two different branches of the Y in a V-shape from the inside of the casting, the width of the channel thus cut being about 1½ in. across at the top and shaping down to the edges with the width of the crack in the bottom, leaving not more than ⅛ in. thickness of metal in the bottom of the crack toward the outside of the casting. The metal was then chipped clean for a distance of 3 in. on each side of the crack for the purpose of reinforcing the weld to this extent. Chipping into the metal of the Y along the crack at the crotch it was found that through the thick part of the crotch, which should have been solid metal for 6 in. through between the two branches, there was only about 1 in. of solid metal in each of the branch plates, there being a pocket

means of the arc between the casting and the ends of the wire, and by skilful manipulation the metal melted from the wire was deposited in the recess chipped out along the crack. After sufficient metal had been deposited in this way to fill up a 1½-in. recess, additional metal was deposited over the crack for a distance of approximately 3 in. on each side of the center line of the crack and built up to a height of at least an inch above the interior surface of the casting. In this way the welded crack was reinforced to an extent that made it far stronger than any other section of the casting. This same process was applied on each branch of the Y, making a complete weld of the metal throughout. The finished weld is shown in Fig. 21 (e). The process of welding took five days, and as soon as it was completed, a heavy steel band was shrunk on the 24-in. branch flange for additional strength and a heavy 3-in. by 4-in. two-part steel clamp was placed around the

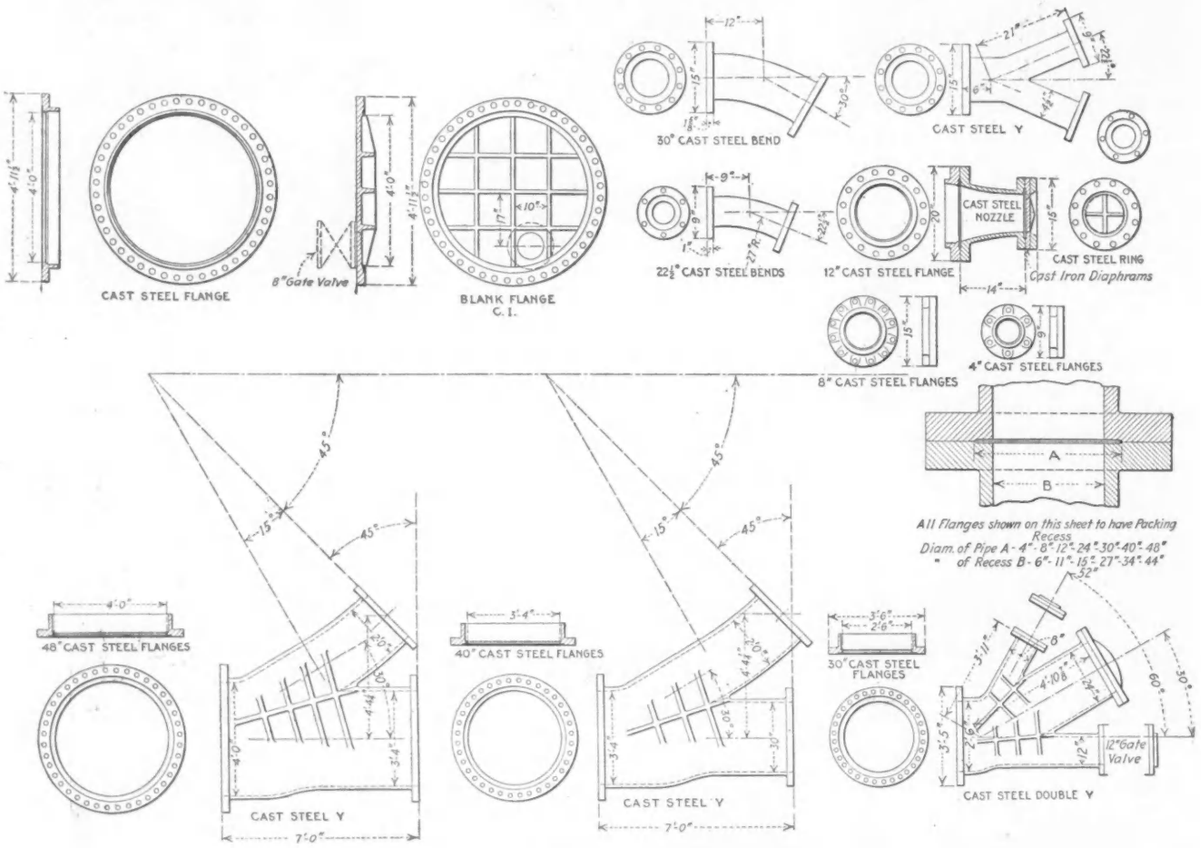

CAST STEEL FLANGE
8" Gate Valve
BLANK FLANGE C. I.
30° CAST STEEL BEND
CAST STEEL Y
22½° CAST STEEL BENDS
12" CAST STEEL FLANGE
CAST STEEL NOZZLE
CAST STEEL RING
Cast Iron Diaphrams
8" CAST STEEL FLANGES
4" CAST STEEL FLANGES
All Flanges shown on this sheet to have Packing Recess
Diam. of Pipe A - 4" - 8" - 12" - 24" - 30" - 40" - 48"
" of Recess B - 6" - 11" - 15" - 27" - 34" - 44"
48" CAST STEEL FLANGES
40" CAST STEEL FLANGES
30" CAST STEEL FLANGES
CAST STEEL Y
CAST STEEL Y
12" Gate Valve
CAST STEEL DOUBLE Y

FIG. 22—DETAILS OF CASTING FOR PRESSURE PIPE

of cinders in this heavy part between the two branches and a hole large enough for a hand, showing that the Y was weakened at the point where it should have been strongest and this fact was doubtless responsible for the failure of the Y. Fig. 21 (d) gives a good idea of the nature of the chipping preparatory to welding, the left-hand section being in the 24-in. branch, while the right-hand (not finished) shows the 40-in. branch. The process of welding the break was then begun, a motor-driven exciter being used to supply 150 amp, the voltage across the arc varying from 30 volts to 50 volts. The process of welding was carried out by grounding the negative side of the circuit to the steel casting and connecting the positive lead by means of flexible cable and clamps attached to ¼-in. fluxed steel wire that was used for making the weld. The electric current passing through this steel wire melted the ends by

40-in. flange. The Y was then placed in the trench and the flanges pulled together, the 40-in. loose flange on the lower section of the pipe being drawn up to the flange on the Y. After getting it in this position the steel flange on the 40-in. pipe was re-riveted and calked so as to make it absolutely tight. After this two additional steel clamps were placed around the 24-in. branch of the pipe and also a heavy beam clamp around the 40-in. section of the Y, as shown in Fig. 21 (f). This beam clamp was only put on for temporary purposes. Two heavy castings were shaped out to fit the circumference of the Y, one on the top and one on the bottom. Eye-bolts were carried across the castings in contact with the 40-in. section of the Y and fastened together with four 2¼-in. steel bolts, thus offering additional strength to resist external pressure as a factor of safety for the welded section of the Y. Fig. 21 (g, h and i)

gives other general views of these steel clamps. Since this repair two additional heavy steel clamps were ordered, one to take the place of the beam clamp. The new cast-steel clamps offer better surface for contact than the cast-iron pieces now used on the bleam clamp, will be safer and more permanent and make a better-looking job. An additional clamp will also be placed around the 48-in. section of the Y for an additional factor of safety at that point, owing to the fact that a small crack has developed. This leak, however, is generally diminishing, and with the clamp in place no danger from this source is anticipated. The repair was completed Nov. 22, 1913, when the water was turned into the pipe and the plant put into operation again.

The manifold is securely anchored in place by embedding the Y-piece in heavy blocks of concrete. Fig. 22 gives the details of the fittings, and attention is directed to the detail of the steel flanges, showing the form of gasket recesses. Round eclipse manhole gaskets are used, varying from ⅜-in. diameter to ⅝-in. diameter, depending upon the size of joint to be made. The recesses are made wide enough to allow for the flattening of the gaskets, and the turned faces of the flanges are bolted up solid, face to face. This joint has been used for years and has given entire satisfaction.

The 12-in. extension of the manifold is used for a relief outlet in case of dangerous over-pressure occurring in the pressure line. This extension is provided with a 12-in. steel gate, and the end of the pipe is fitted with a heavy steel flange, to which is bolted an 8-in. diameter cast-steel nozzle. Between the flange and the nozzle is placed a tested cast-iron blank disk with a circle turned in the face of it, leaving a thickness of metal in the turned groove of ¼ in. This cast disk is designed to blow out with a rise of pressure of 40 per cent above normal and relieve the pipe line. The disk has never blown out in practice, but several of the sample disks were broken experimentally. Preparations are being made at present to replace this disk with an automatic relay relief valve that can be adjusted to any required pressure.

A Comparison of Rate Theories

A paper on "Rates: A Résumé and Comparison of Rate Theories," read before the Spokane convention of the Northwest Electric Light and Power Association by Mr. Stacy Hamilton, of the Portland (Ore.) Railway, Light & Power Company, contained a discussion of some of the good and bad features of various rate theories and gave many valuable references to court and commission decisions relating to this subject. He said that simplicity of expression is one of the chief requisites of a system of rates. In addition, they should be equitable and should encourage the greatest profitable development of the particular class of business to which they refer. Rates which make the charge for service practically proportional to the value of the service will naturally tend toward the greatest development of the business as consumers are more easily convinced of their fairness. While the cost of service is the most equitable basis on which to establish rates, from the central-station point of view such a basis, while still accepted as the primary basis for rate schedules, must often be considerably modified for the sake of simplicity of expression and from commercial and economic considerations of the value of service and the development of business. Among the forms of rates discussed were the flat rate, straight meter rate, straight demand rate, two-charge demand (Hopkinson) rate, Wright demand rate, consumers' output rate and off-peak rate. Differentials, determination of demand and minimum charges were also discussed.

FOUR VIEWS ON CO-OPERATION

Representatives of the Contractor, Manufacturer, Jobber and Central Station Show How Various Interests May Reach Co-operative Plane

In the account of the convention of the Jovian Order printed last week notice was taken of the four interesting papers on co-operation written from the respective standpoints of the contractor, the manufacturer, the central station and the jobber. Brief abstracts of these papers follow here.

Mr. J. R. Galloway, Washington, president National Electrical Contractors' Association, analyzed the position of the contractor. The contractor's close relation to the ultimate consumer, said the speaker, and his intimacy with the installation and use of electrical equipment and appliances particularly fit him to suggest new and necessary things to the manufacturer. Too much emphasis cannot be placed upon the importance of the contractor as a factor in the development of the industry. In closing Mr. Galloway exhorted each Jovian to exert his utmost efforts to bettering trade conditions and declared that much individual effort would be required to effect the result desired collectively.

Representing the manufacturing interests, Mr. P. M. Lincoln, Pittsburgh, president of the American Institute of Electrical Engineers, delivered a short address entitled "Co-operation Between Allied Electrical Associations," in which he urged "parallel operation" of societies whose aims are alike. Mr. Lincoln's most significant remark came in the summary of his talk, when he called attention to the similarity of the Jovian slogan, "Altogether all the time for everything electrical," and the slogan of the Society for Electrical Development, Inc., "Do it electrically."

In a talk on practical co-operation, which he said might well be entitled "Current Development," Mr. A. C. Einstein, St. Louis, president of the Union Electric Light & Power Company, declared that only the central station can create a demand for electric service. Hence it should have the hearty support of all other electrical interests. While these sentiments, said he, are selfish in a measure, they point to a way by which the various interests may reach a co-operative plane. Of the local situation Mr. Einstein said: "We do sell lamps and appliances, it is true, not, however, in competition with other electrical interests but to create a demand for things electrical and to help the other branches of the industry." As an instance of the co-operative spirit of the Union Electric Light & Power Company, Mr. Einstein cited the fact that a 27 per cent reduction in electric service rates had been made during the last two years. These reductions augment business, and although the company's revenue suffers temporarily, the reductions have taken electric service out of the luxury class and made it a necessity.

The title of the address of Past-Jupiter W. E. Robertson, Buffalo, was "Elements of Successful Selling," but in the beginning he digressed to agree with the sentiments of Mr. Einstein on the relative importance of the central station. He also commented upon the speech of Mr. Lincoln, saying that while there are now three great parallel movements afoot in the electrical industry, it is his belief that those things which can best be done by the Jovian Order will be done. In like manner other good works will be accomplished by the Commercial Section of the National Electric Light Association and by the Society for Electrical Development. In time, there will come elimination of whatever waste may occur from duplication of effort.

Of the elements of successful selling, the speaker said that sincerity, industry and intelligent use of information gained in business come first.

Stimulating Electric-Vehicle Progress*

Industrial revolution in city transportation methods awaits guidance of central-station executives—Enormous loads available in freight movement. By James H. McGraw

WHAT can be done to invigorate the electric-vehicle business? This is a prevailing question in the minds of all who are concerned, and as a detached and keenly interested observer I have been trying to resolve the question into its elements to discover those that retard and those that accelerate the use of electric vehicles.

Two features of the problem which stand out boldly are the wealth of possibilities for large development and the abundant resources among those engaged in the business. Yet in spite of great possibilities there is evidence of sterility in the comparatively little progress made. I say comparative progress advisedly, because I am not unmindful of the great number of vehicles already in service; but in view of what can be done and will be done this is only a very limited beginning.

Causes of Slow Growth

If, therefore, we may be permitted to regard the present situation as unsatisfactory, what are the causes? Aside from the generally depressed condition of business throughout the country, my investigations indicate that there are three reasons for the slow growth: First, the novel character of the business, which, while it has brought large installations in the commercial field and successfully launched the passenger car, has been depended upon to carry the business to a point where exhaustion has set in. Second, those responsible for the administrative conduct of the business have done little in a constructive or creative way to open up new lines of endeavor in exploiting their product, and have depended too much upon the routine performance of subordinates. Third, effective collaboration from central-station companies furnishing energy supply (which has been depended upon as an interlocking necessity) has not been received to the extent to which it must be exerted.

All these elements can be corrected and improved without superhuman effort or extraordinary revolutionary undertakings by simply applying to them such reasoning as will develop adequate comparison with progress made in other lines of business, and by adopting principles which have been known to bring results.

Electric Vehicle Not Yet Commercialized

Taking up the first cause, we have a condition analogous to that which previously existed in nearly every other field of commercial endeavor where the introduction of new methods or of improved equipment became a problem. The same conditions obtained. Whether it was agricultural implements, railway equipment, sewing machines, telephones, safety razors, pianolas, newspapers, electric lighting or any of the myriad other refinements which have combined to improve our economic and social life, the same ebb and flow has been experienced, and in no case has substantial progress been accomplished until the impediments of novelty have been ruthlessly brushed aside by the stern and irresistible necessities of commercial enterprise.

This is the case with the electric vehicle. It has hardly reached a transitory stage. It is not yet commercialized. We are still fondling it as a luxury, hesitating to put behind it that dynamic energy necessary to force it upon the public, which does not know its value and which is waiting to be convinced that it must have it and use it in great numbers as an economic necessity.

With all the merit which the electric vehicle possesses to warrant its employment in every well-to-do family as a domestic convenience, and in mercantile houses as the cheapest and most expeditious conveyance yet devised, there is no reason to wait for a Ford or an Edison, a Pope or a McCormick to thrust it into universal use by sheer force of genius. This could be accomplished almost immediately if the latent power of those conducting the business were brought into service and united with all the collaborating influence which can be marshaled to their assistance. Unfortunately, the glamour of the gasoline pleasure car still infects the business. The "joy rider" and the speed maniac are still with us. It is essential, therefore, to secure for the electric vehicle of either type a utilitarian consideration. Mercenary incentives must be implanted and the toy-shop tendencies uprooted before the art of buying and selling machines can reach the level and security of normal every-day trade and commerce.

Executive Guidance Necessary

Considering the second cause, it must be evident to every keen observer that the solution of most of the many difficult problems now left to the salesmen must be made by those justly responsible for administrative functions. The inclination to drift with the tide of things and be satisfied with business that can be readily secured, without any effort to sift out and win by sheer merit the more difficult but more profitable undertakings, must be checked. The excuse that the business is new and that time is necessary to overcome obstacles is no more valid in this line than in others. On the contrary, the reward which awaits industry in this field is infinitely greater than that which falls to the lot of business projectors in other fields. However, these anticipated results will never be secured automatically. They can only be won when the strongest kind of administrative energy is directed against the obstacles involved.

The present semblance of weakness must be entirely changed, and upon the administration must be laid the task of discovering, testing and establishing those methods of organization and management by which all business productive energies may be united, stimulated, guided and rewarded. Then all the possibilities covered by the enormous scope of this industry may be forced to yield that increase in the application of electrical machines which will transport the entire vehicular tonnage of freight now moved within the city limits, as well as supply the latent demand for that immense passenger traffic of a domestic, professional or commercial character which awaits only an enforced recognition of the cheap, convenient facilities of the electric carriage.

*Read at convention of Electric Vehicle Association of America, Philadelphia, Oct. 19, 1914.

Central-Station Opportunity

It is as much within the province of companies selling electrical energy to supply it for moving freight and merchandise as for other power applications for illumination or for passenger transportation. Yet the project has never been taken up seriously enough by them to realize the significance of its value as compared with that of the load now sought in their routine channels. Perhaps this is because their efforts are so intensive in their beaten paths of business that they are too much engrossed to see the possibilities in new directions. The fact remains, however, that a great opportunity is passing by, practically unseen except for a limited attention which is insignificant in comparison with what the prospect demands. If anything like the same amount of energy as is now directed to secure and maintain the lighting load or the industrial load were made effective to secure transportation load, this latter might become the dominant direction in which electrical energy would be supplied.

Enormous Load Available

Some conception of this city vehicle load may be gained by reference to the volume of our transported materials in other directions. The annual tonnage originating on railroads for the past eight years has averaged 800,000,000. An equal amount was transferred to connecting railroads, thereby making the total annual rail tonnage more than 1,500,000,000. It would be fair to assume that at least one-third of this finally reached our principal cities and was carted there at least twice over a distance of only one mile. We have a minimum of 1,000,000,000 ton-miles per annum. If the public service electric companies secured this business as completely as they have secured city rail passenger transportation and illumination—and it is practically within their reach—their profit would be enormous, because there would be no such permanent investment or expense as is required in the present fields of their activity.

It is generally conceded that the freight tonnage reaching cities is handled many times over, but, assuming as above that it is simply handled once from the railway to business premises and afterward to the consumer, 1,000,000,000 ton-miles at an average energy consumption of 5 kw-hr. per ton-mile would at the 4-cent rate reach a total figure of $200,000,000 per annum. This equals very nearly the total gross income of all central stations now engaged in business in the United States, and if this tonnage were handled for one additional mile the revenue would practically equal the total gross income of all electric-railway organizations in the country. Here is a field for leadership to awaken the dormant energy within the ranks of the workers in this industry and to marshal the many powerful potential agencies which are willing to serve and which await only executive command and guidance to engage in a fresh and brilliant campaign of energetic business.

Heartier Central-Station Support Necessary

Now to consider the third cause. It may well be acknowledged that the attitude of the majority of central-station organizations is favorable toward the advancement of electric-vehicle projects, and that at least a half dozen of the larger ones are conducting organized departments for the advancement of vehicle use. Furthermore, all of them have liberally contributed to the funds of the general advertising campaign which has done such effective educational work in the past few years. However, it is equally plain that the central-station effort is not at all in keeping with the enormous vehicle load which stands practically at its doors.

With constructive motives in mind, let us look a little deeper into the situation. It has taken a long time and much persuasion to develop the friendly disposition that exists, because central-station men in the past have looked at the proposition from the wrong end of the telescope, believing that the matter was not of particular interest to them and that they were being invited to pull chestnuts out of the fire for the manufacturer. Most of them did not look with favor upon the electric vehicle anyway. Some thought the designs were defective, and that their intimate knowledge of electrical engineering qualified them to do the job better than the fellow who had his money at stake on his product. A few central stations at first consented to patronize the art by buying and using one or more machines, usually specifying such off-standard equipment as to distort the design and eliminate the profit, all with a strangely adverse disposition very hard to account for.

Fortunately most of this feeling has disappeared. Great numbers of machines have been purchased for all kinds of service. They are now advertised and advocated, at least in the principal cities, because it has become the policy of the management in each case to foster their employment. Down the line, however, among the departments, they are not yet so favorably accepted. Gas cars are preferred for their dash and speed and the great advantage, if ever required, of ability to go 80 miles or 100 miles away from the base. Few of the operatives are willing to make compromises for the general good of the cause.

Business Features Overlooked

What the situation really needs is a much more serious recognition of the business features of the entire project. It should be taken in hand with purely selfish motives, and not because of a desire to render charitable assistance to the manufacturers, or because of good fellowship in yielding to the persuasion of associations pleading the cause. "There's millions in it" should be not only a working slogan but the underlying conviction of those who own or control central stations.

The lack of administrative attention in the central-station field is practically similar to that described in the vehicle-manufacturing field. Not many have an adequate conception of the magnitude of the project or the feasible means of its accomplishment.

It seems astounding that with the administrative talent which has been concentrated upon all the large communities in this country to sell electricity for illumination, for industrial purposes and for city rail passenger transportation, the plain and practical project of transporting the immense freight tonnage in cities by means of vehicles using central-station energy should be neglected and almost ignored.

It may be difficult to answer the question as to what can be done to quicken that administrative genius so as to secure the immediate concentration and guidance of those scientific methods of business which have been brought to bear so successfully upon the commercialization of other kindred electrical utilities, but the answer will be forthcoming.

I have indicated in what direction the salvation of the industry lies. We need to show the central stations of the country the great market offered by electric vehicles when they come into their own, and to induce them to preach their use in season and out of season as they do the use of lamps, motors and heating devices. Freight loads are larger than passenger loads and possess greater diversity. If, therefore, it is profitable to transport human beings electrically, how much more so would it be to transport freight; and if central stations are eager for railway loads, they should be even more keen to secure electric-vehicle loads. I think they need only to be shown.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Water Heaters in Canada Supply an All-Night Load

The Hydro-Electric Power Commission, Toronto, Canada, reports that one of the most useful electrical appliances in operation among its rural customers is an off-peak hot-water heater. In most cases a 600-watt heating unit is used with a 200-gal. tank, the farmer placing the heater in operation at night when he retires and turning it off when he arises in the morning. In this way a liberal supply of hot water is available early in the morning for mixing hot feed or for cleansing milking-machine parts and other dairy equipment.

Suggestions for Electrical Gifts

One of the most attractive booklets which the Commercial Section of the National Electric Light Association has ever offered to central stations is entitled "Gifts That Please." The booklet, which has just made its appearance and contains sixteen pages, deals in an attractive manner with the various electrical appliances

DESIGN OF COVER AND ENVELOPE

suitable for Christmas presents. It is prepared in two colors with engravings that should appeal particularly to the housewife, and it brings out the modern idea of giving gifts which have a utilitarian as well as an artistic value. The Commercial Section purposes to issue many thousands of these booklets, which will be offered at prices within the reach of every central station. Envelopes of special design are also obtainable. The size of the booklets is such as to make it possible to inclose them with the monthly statements of central stations or to distribute them over the counter to those who come into the office to pay bills, or from the various electrical stores throughout the town. The accompanying illustration shows the cover design of the booklet as well as of the envelope to inclose it. No attempt is made to advertise any particular make of apparatus, and the engravings accentuate convenience, saving of time and labor as well as decorative and ornamental features of the appliances shown. The last page lists thirty-nine electrical-gift suggestions. Mr. N. H. Boynton, Box 387, Cleveland, Ohio, is the sales manager of the publications committee of the Commercial Section of the National Electric Light Association, under whose auspices the publication is issued.

Appliances for Increasing Central-Station Revenue

At the recent Northwest Electric Light and Power Association convention held in Spokane, Wash., Mr. H. B. Peirce pointed out in a paper on "Electrical Appliances" that the reduction in central-station revenue brought about by the introduction of high-efficiency lamps and a reduction in rates may be offset by connecting a large appliance load to the system. Consumers should not only be sold devices which will be required the largest number of hours per day, but these appliances should be maintained in operating condition to keep the customer satisfied and to insure the maximum load on the system at all times. The advantages of various heating and motive appliances were discussed and their relative values as revenue producers brought out. As flexible cords are the most vulnerable part of most appliances, their owners should be supplied with duplicate cords, or else should be instructed to bring defective cords to the office, where they will be exchanged for good conductors.

Electric irons, in the author's estimation, are at present the best revenue-producing appliances which can be attached to lamp sockets. Among other heating devices used extensively are the electric toaster, percolator, heating pad, table grill and hot-plates. Ranges which will operate economically are now on the market with the heating units inclosed in thin armor which will not retain much heat but will prevent rapid oxidation of the resistance wire. The domestic water supply of a small family can be heated in a 30-gal. tank containing a 600-watt heater connected permanently to the house circuit. In this paper was also a description of the construction and operation of a special water heater developed by the Washington Water Power Company. For heating houses by electricity the author recommended a hot-water system with a continuous heater installed around the baseboards of each room. Although the revenue from motor appliances is not great, they are a desirable load when installed in the same house with heating appliances, as a customer questioning a bill mentally appears to credit a motor-driven device with more work than a heating appliance. The author advised that electric fans should never be rented or sold on trial but sold outright, recommending that electric-service companies keep the stock and allow contractors to draw on it at jobbing prices. Other appliances whose advantages and uses were discussed were suction and vacuum cleaners, sewing machines, vibrators, utility motors and clothes-washing and dish-washing machines.

Flat-Rate Easy-Payment Plan for Wiring Houses

The Edison Electric Illuminating Company of Brooklyn, N. Y., has offered residents of that city an opportunity of having their houses wired for electric service at a flat rate per room and of paying for the work in monthly instalments. The plan has been made flexible

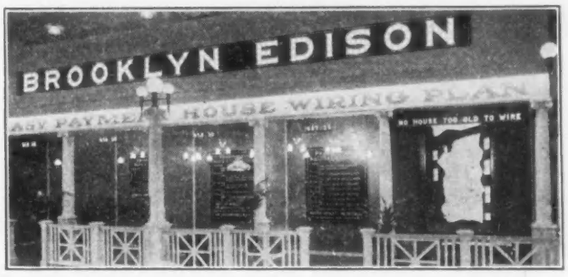


FIG. 1—SOME OF THE ROOM-WIRING PROPOSITIONS

to meet the requirements of rich, poor, large and small consumers who may be on the distribution circuits of the electric-service company. One advantage of the proposition is that a contractor's estimate does not have to be made on each installation; therefore the central-station new-business solicitors can quote prices directly to prospective consumers. The prices range from $19.45 for wiring a kitchen alone to $64 for a kitchen, dining-room, living-room, hall, bedroom and bathroom. To have a house wired on this plan the kitchen must always be included. This room was selected as the basis on which to set the prices, as it was assumed that electricity would be used more there than in any other part of the house. After one room is wired the rest can be connected considerably cheaper, so that a small charge for each additional room serves as an inducement for the prospective consumer to equip the entire house.

Very attractive spun-brass chain-pendent fixtures are furnished in the rooms where this type is suitable. If anyone desires fixtures more or less elaborate than those furnished, deductions are allowed for the latter and the consumer may select and purchase any kind he wishes. If the rooms which are wired are not all on one floor, an additional charge of $5.50 is made for each riser which has to be installed. Armored cable is employed exclusively for these installations, and the conductors are entirely concealed. Walls, ceilings and floors do not have to be ripped open, as the wires are fished between outlets; therefore the occupants of a house are not inconvenienced by dirt and a torn-up house.

In the accompanying tables are the prices quoted with this proposition. From the data any person is able to figure out what it will cost to equip his home for electric service. For wiring any combination of rooms the company requires a payment down of not less than 8 per cent of the total cost. The minimum monthly instalment allowed is $2 and the maximum time permitted to complete payments is twenty months. If the balance after the first payment is made falls between $24 and $36, the instalments must be made in twelve monthly payments; if between $36 and $60, fifteen months is allowed; between $60 and $90, eighteen months, and for $90 and over, twenty months.

In selecting the flat rates which are being offered the company consulted several reliable contractors to find out what they would charge per room for wiring. An average was taken of the bids submitted and each was asked if he was willing to do the work at that price. Before the proposition was made public about twenty had agreed on the standard prices shown herewith. Practically all of the contractors in Brooklyn have now accepted the terms and are co-operating with the electric-service company to secure new business. The lat-

FLAT-RATE WIRING PRICES AND DEDUCTIONS

KITCHEN	
No. 1—Outlet consisting of a baseboard or wall flush receptacle, installed in kitchen on first floor, and one ceiling outlet with one-lamp fixture and pull-chain socket.	$19.45
CELLAR	
No. 2—Ceiling receptacle in cellar at heating apparatus with flush switch at head of cellar stairs	7.75
HALL	
No. 3—Ceiling outlet in hall with one-lamp chain fixture and pull-chain socket (if wall bracket fixture is desired instead deduct 85 cents)	8.10
DINING-ROOM	
No. 4—Dining-room outlet with three-lamp shower fixture, pull-chain sockets (if amber glass dome is desired instead add $1.50)	11.75
PIAZZA	
No. 5—Outlet on piazza with ceiling fixture and globe with switch in hall	10.00
BEDROOM	
No. 6—Bedroom outlet with two-lamp shower fixture, pull-chain sockets	8.00
PARLOR	
No. 7—Parlor outlet with four-lamp shower fixture, pull-chain sockets	10.50
CHINA CLOSET	
No. 8—China-closet outlet and bracket fixture with pull-chain socket	6.20
BACK PORCH	
No. 9—Back-porch outlet and bracket fixture with switch.	10.35
PANTRY	
No. 10—Pantry outlet and one-lamp bracket fixture with pull-chain socket	6.20
BATHROOM	
No. 11—Bathroom outlet and one-lamp nickel-plated fixture, pull-chain socket	6.20
ALL OTHER OUTLETS	
No. 12—All other lighting outlets with one-lamp bracket fixture, pull-chain socket	6.20
No. 13—Two three-way switches for controlling hall lamp from upper or lower floor	9.90
No. 14—Floor, baseboard, wall, or ceiling receptacles	4.95
No. 15—Bell-ringing transformers for alternating current only	4.95
No. 16—Flush wall switches	3.85
INSTALLING RISERS	
No. 17—For each additional floor above first floor add	5.50

DEDUCTIONS FOR FIXTURES IF PERSONAL SELECTION IS DESIRED

No. 1	$1.30	No. 6	$3.05
No. 3	2.10	No. 7	5.50
No. 4	4.65	Nos. 8, 9, 10, 11, 12, each	1.25
No. 5	.70		

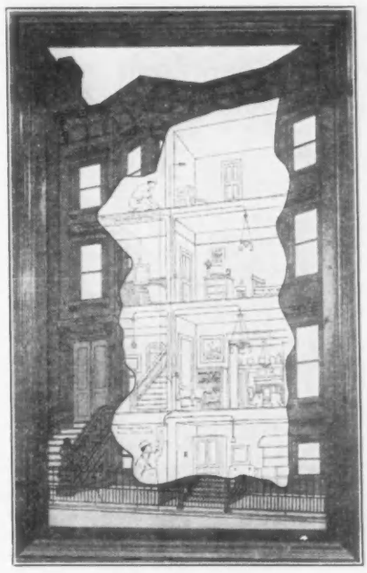


FIG. 2—SIMPLIFIED METHOD OF WIRING

ter has published a booklet containing the names and addresses of contractors and fixture dealers in Brooklyn. The lists are furnished to anyone contemplating the installation of electric wiring and equipment. When a contract is closed for wiring a house on the easy-payment plan the contractor is selected by the manager of the district in which the order was taken. In this way the company tries to apportion the business fairly.

Contractors in working up their own business have frequently come across persons who are unable to pay cash down. In such cases they refer the person to the easy-payment plan. Under this proposition the contractor furnishes the material for wiring and installs the equipment, while the electric-service company supplies the fixtures. The interest taken by contractors in the flat-rate plan of wiring houses was shown by their promoting the proposition at the electrical exposition held recently in New York City.

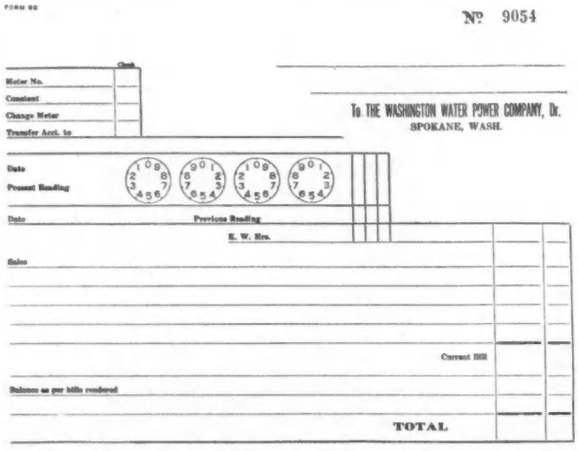
Collections from Small Customers at Muncie, Ind.

At Muncie, Ind., there are many customers on the lines of the central station who, using electricity on a controlled flat rate, pay the electric company $1 each month. Speaking before the recent convention of the Indiana Electric Light Association, Mr. Thomas F. English, manager of the Muncie Electric Light Company, said that collections from this class of customers were considered very good, less than 2 per cent of them ever becoming delinquent.

To insure prompt payment of the electric-light bills a 25-cent penalty is imposed for failure to pay within the specified time. The company's customers call at the office to pay the bills at present, but Mr. English says that he believes the European coupon billing and collection system, or a variation of it, could be used.

Traveling Meter Reader's Report Form

The Washington Water Power Company, Spokane, Wash., which supplies electricity to a number of rural communities, employs traveling agents to read meters, make collections and secure new business. Notations of


FORM 66

No. 9054

Clerk

Meter No.
Constant
Change Meter
Transfer Acct. to

To THE WASHINGTON WATER POWER COMPANY, Dr.
SPOKANE, WASH.

Date
Present Reading

Date
Previous Reading
K. W. Hrs.

Sales

Current Bill

Balance as per bills rendered

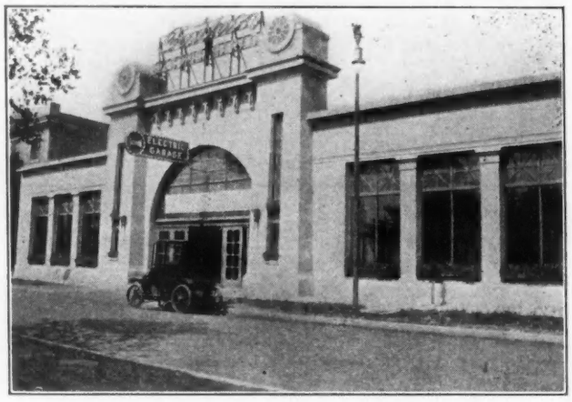
TOTAL

TRAVELING SALESMAN'S TRIPLICATE FORM OF BILLING

instrument readings and any transactions made with a consumer are filled in on a form similar to the one reproduced herewith. The report is then sent to the district superintendent's office, where all accounting and billing is done. This office in turn informs the commercial agent of the parent company concerning monthly sales, earnings, collections, etc.

Advertising Exclusive Electric-Vehicle Garaging in Chicago

In Chicago there are many garages where electric-vehicle charging equipment is installed and in which both electric and gasoline automobiles are cared for. There are some garages in which the business of electric-vehicles alone is solicited. One of these, the Fashion Garage, in the vicinity of exclusive residential districts



EXTERIOR OF ELECTRIC-VEHICLE GARAGE

on the South Side of the city, recently placed a large painted banner over its door advertising the fact that "the entire building is now being used exclusively for electric-vehicle garaging." Exploiting this exclusive electric feature proved a good stroke of business, as nearly everyone in this age is wont to believe in the remarkable good to be gained by specialization.

Development of Electric Service Business in Rural Districts

The method of canvassing rural territories for business preparatory to extending a transmission line and the subsequent manner of developing this business so that the installation expense may be justified were described in a paper entitled "Extensions of Electric Service Into Small Country Communities and Rural Districts," by Mr. M. C. Osborn, of the Washington Water Power Company, at the Spokane meeting of the Northwest Electric Light and Power Association. Preliminary canvasses of the towns are made to ascertain whether business is available, then fifty-year franchises and ten-year contracts for lighting the streets are secured. The next step taken is to close contracts for electric service and to wire the buildings where electricity is desired. As the construction work nears completion salesmen are sent out to sell fixtures and appliances and leave some devices on trial. When the lines are energized the new service is advertised and many new consumers are obtained in this way. In twelve towns served in this way which have a combined population of 4158 people 877 were connected at a capital cost of $256.30 apiece. The revenue for the first year amounted to $54 per consumer, or $11.40 per capita. The total profit derived in the same period from appliance sales and wiring contracts amounted to $2,464, or about $2.80 per consumer.

The method of supervising and operating this portion of the company's system was also described in the paper. Tables were included showing the profit on wiring in different localities and the relation between gross monthly and yearly revenues and between estimated yearly income and the actual revenue obtained.

Illumination and Wiring

Safeguards on Decorative Lighting, Indianapolis

The parapet protecting the edge of the roof garden on the Hotel Severin at Indianapolis, Ind., supports ornamental lighting units which outline the top of the structure at night and help to illuminate the tables

PROTECTOR FOR DIFFUSING GLOBE

used by the garden's visitors. Standing at the extreme edge of this thirteen-story building, the large diffusing globes which surmount these standards would present a hazard to the pedestrians beneath if the glass were not properly safeguarded. The needed protection is afforded, as is shown in the picture herewith, by inclosing the globes in a strong wire network which is attached to the iron standards.

Features of Detroit's Proposed Electrical Ordinance

There is now before the City Council of Detroit, Mich., an ordinance to regulate electric wiring construction and the use of electricity. Among its provisions is the stipulation that armored cable shall not be used where conductors are subject to moisture or under floors where they are liable to mechanical injury. In commenting on the ordinance Mr. Frank R. Mistersky, city electrician and superintendent of public lighting, says:

"While it is true that the National Electrical Code requires that a lead sheath be placed between the outer braid and the steel armor of cables to be used in damp places, these rules make the ultimate result depend upon the good judgment of the contractor, who is not always a competent engineer. When in an inspector's judgment it is necessary to replace such work there is a direct loss. It is to prevent such loss and the accompanying delay and annoyance that limitations have been placed on armored cable.

"Some cities require wiring in metal conduit only within the so-called fire limit or in buildings of certain class or size. The Public Lighting Commission of Detroit, however, believes that there should be no distinction unless the cost is prohibitive for the smaller installations. It is believed that the greater safety secured is well worth the additional cost."

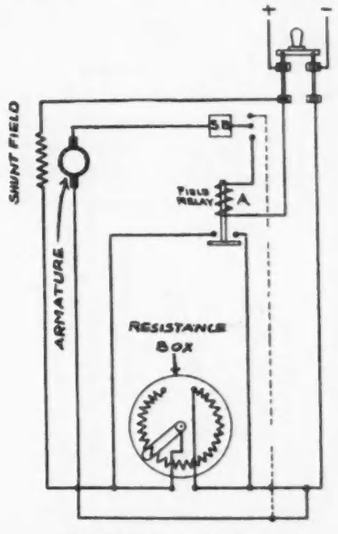
Perhaps the most unusual provision in the ordinance is that allowing only a single service connection to a building. Detroit is especially fortunate in having alleys in the rear of practically all property within the city limits. This scheme of thoroughfares enables underground cables in the streets to be connected to overhead distribution lines in the alleys, making an ideal system without excessive investment. The ordinance, in allowing but one service connection to a building, will, it is hoped, avoid the unsightly wire tangles which have existed in many back yards.

The ordinance also provides for basing the schedule of fees for inspection on the number of circuits in a building instead of basing it on the number of lamps. Separate permits for fixture and wiring work are issued by the city's electrical department, and in the past some contractors have escaped a part of the inspection fee by understating the number of lamps to be installed. The fixture man paid the full fee, for the inspector could, with the job completed, see how many lamps were to be used. Basing the fees on the number of circuits will relieve this difficulty.

Short-Circuiting a Field Resistance When Starting Shunt Motor

To prevent a shunt motor drawing excessive current during acceleration it has generally been necessary to cut out the field resistance by hand before starting and after the motor has accelerated gradually to insert resistance until the desired speed is obtained. This procedure is unnecessary if a relay coil is connected in series with the armature, as shown in the diagram, so that an excessive current flow will cause the contactor to short-circuit the field resistance. Thus, at starting, if the field resistance is set for high speed, the armature will momentarily draw an excessive current, closing the contactor and cutting out the resistance. As the motor speed picks up, the relay will drop, allowing the current to build up because of the weakened field. The contactor will close again, going through the same cycle of operations and vibrating until the desired speed is reached.

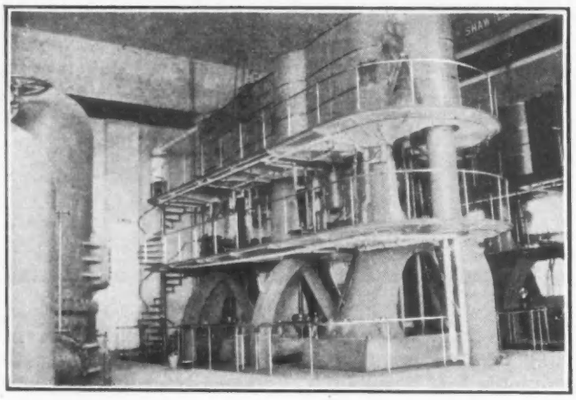
A relay so connected will also cut down the effect of overloads by allowing the speed to drop, thereby preventing the opening of the main circuit-breaker. Moreover, it will compensate for a sudden change in the field resistance made by an inexperienced operator. If dynamic braking is employed on motors equipped with a relay connected as described, it will close when the braking current is flowing, raising the field excitation and thus causing the motor to come to rest more quickly. This use of a relay was suggested by Mr. Stewart C. Coey at the Iron and Steel Electrical Engineers' convention held recently at Cleveland, Ohio.



CONNECTIONS OF RELAY

Lighting a 12,000,000-Gal. Pumping Engine

A gigantic steam pump supplying water to the mains of the municipal water system at Grand Rapids, Mich., is lighted by means of three circuits of lamps, each of which completely encircles the platform decks. Suspended from a single line of conduit attached to the



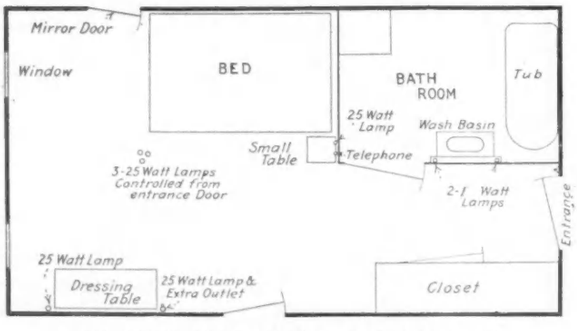
PUMPING ENGINE AT GRAND RAPIDS

white under-surface of the platforms, the forty-five 5-cp lamps light all parts of the machinery so that workmen may enjoy increased safety.

Each of the three circuits is controlled separately from a steel-wall cabinet near the engine. At present Mr. Charles W. Merritt, engineer of the plant, is in doubt as to whether or not he dares operate this lighting, for the city's electrical inspector has declared that forty-five outlets per circuit is too many, according to the Grand Rapids ordinance, even though each socket carries but a 5-cp lamp. This consideration, Mr. Merritt says, will be taken into account in placing lighting circuits on a new duplicate pump just installed. Each pump is capable of delivering 12,000,000 gal. of water in twenty-four hours.

Electrical Conveniences in a Hotel Room

Attention or inattention to detail makes or leaves unmade that attribute of a hotel which the traveler designates as good service. This attention to detail may be carried out in the physical equipment of the rooms by the installation of electrical conveniences to make



BEDROOM WIRING LAYOUT, SEVERIN HOTEL

them pleasant, comfortable and commodious. As an example of what can be accomplished along this line a sketch of a typical room at the Severin Hotel, Indianapolis, is presented herewith, the position of lamps and electric outlets being included in the drawing.

The general lighting for the room is supplied from a central ceiling outlet controlled from a push-button switch near the entrance to the room so that a guest does not need to grope in the dark or search his pockets for a match to find the lighting fixture. There are three 25-watt lamps in this central chandelier. Other fixtures, of which there are five in all, are controlled by pull-chain sockets at the bases of the individual lamps. The lamps are so placed that although the installation is economical, yet there is ample illumination at both sides of the mirrors in the bathroom and on the dressing table. One of the fixtures beside the dressing table is provided with a double socket so that a heating appliance may be used without removing any of the lamps from its place. Beside the bed there is a wall receptacle to which is attached a portable reading lamp, and the telephone is kept on the same table with this handy unit. The connected lighting load of a typical room is 180 watts.

Letter to the Editors

Payment and Responsibility of Directors

To the Editors of the Electrical World:

SIRS:—A letter printed in your issue of Aug. 29, "Payment and Responsibility of Directors," closed with the following sentence: "Their duties as trustees are of a peculiarly responsible and complicated nature, and their compensation should certainly be much more than 12 cents for each $10,000 of income before they can reasonably be expected to give more time and thought," reference being made specifically to directors of electrical properties.

The opinion expressed in this quotation will not be welcomed by the average stockholder, who finds his dividends threatened on every hand; nor is the necessity apparent for a salaried directorate. There is a better solution for the situation, which is becoming acute.

In theory directors are such by reason of a large personal interest as stockholders. They occupy the position as of right for the protection and conservation of that interest, and as of duty for the protection and conservation of the interests of smaller stockholders. Neither consideration entitles them to pay.

Morally stockholders are responsible for the affairs of the company in proportion to their interest, to their information and to their ability to do things.

Of late years the above qualification for directors has oftentimes been neglected; some interest commands votes enough to elect directors subservient to its dictation, which may or may not be for the highest interest of other security holders. A further extension of this policy is the "dummy" director.

The corrective is not for the stockholders to put directors on salary, but to put them on honor. First aid for the situation is a return to first principles. Elect as directors men of large holdings who have a due sense of trusteeship and will exercise independent judgment.

To adjust the situation fully directors should provide themselves with more definite and conclusive information as to the affairs of the company, with positive concise data as to condition and tendencies. This would conserve their time and afford a proper basis for correct decisions on questions relating either to policy or equipment.

In an editorial in the issue of July 18 you state regarding the responsibility of directors to safeguard properties: "To do it they will have to give time and thought far beyond their past ideas." With informative data in their hands, as here suggested, this would hardly seem necessary for directors who have a just sense of trusteeship.

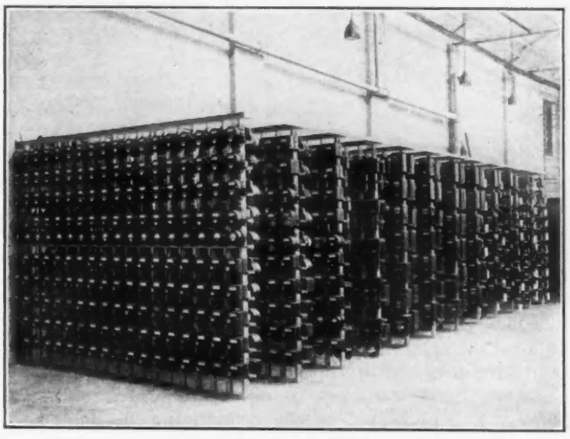
Brookline, Mass. WALTER STUART KELLEY.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Storage Racks for Electric Meters

The accompanying illustration shows the storage racks for electric meters which have recently been installed in the Monument Street meter-testing laboratory of the Consolidated Gas, Electric Light & Power Company of Baltimore, Md. The racks are made of



ELECTRIC METERS IN STORAGE RACKS

angle iron and are skeleton in form, permitting the meters to be hung in the same position as they are when installed. In addition, the company number and data are in plain sight, making it possible to locate a meter without moving the others to get at it. The arrangement offers a great improvement over that which formerly obtained. Heretofore the meters were stored in bins and piled on top of each other two and three layers deep. As many as thirty-two small meters were often stored in one bin, and a hunt for a particular meter often necessitated removing and replacing almost all the others. The convenience of the new arrangement was clearly shown recently when the semi-annual inventory of meters was taken.

Characteristics of Mechanical Stokers

Mechanical stokers are practically limited to the firing of bituminous coal, as anthracite fuel can be handled successfully only with mechanical shovelers which require almost as much attention as hand firing. As pointed out in a paper presented recently before the American Electric Railway Engineering Association, the principal requirements of a stoker are to coke the green coal, mix air with the volatile matter where it can be ignited, burn the fixed carbon, dispose of the ash and clinker, and prevent sifting and clinker adherence to the brickwork and stoker parts.

Overfeed Stokers

In all overfeed stokers the coal is fed in at the top and allowed to coke as it is gradually forced downward by gravity and rocking of the bars. As the green coal packs closely, air must be supplied through the lower part of the grate or through openings in the arch. The length of flame for a semi-bituminous coal containing 17 to 25 per cent volatile matter is over 30 ft. with these stokers. The distance from the grates to the tubes varies from 5 ft. to 9 ft. Accumulation of clinker must be prevented by slicing and periodic dumping. Too frequent dumping will prevent the complete combustion of carbon in the clinker, while the other extreme will cause the clinker to become large and hard to dislodge. Five to 8 per cent of the fuel will sift through overfeed grates,

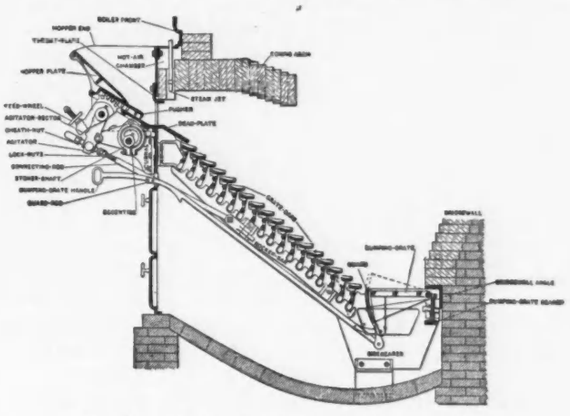


FIG. 1—FRONT-FEED STEP-GRATE STOKER

depending on the amount of air space and the condition of the grates. At the present time it is considered good practice to provide a stoker which is capable of operating the boiler at 200 per cent of its rating continuously.

Chain-Grate Stokers

On chain grates coking occurs at the entrance to the stokers, but as the coking arch is much longer than for slope grates, the air and volatile matter are mixed more

AVERAGE DATA FOR STOKERS

Type of Stoker	Step and Slope Overfeed	V Overfeed	Chain Overfeed	Gravity Underfeed	Horizontal Retort Underfeed
Average price per rated boiler-hp	$3.60	$3.60	$3.50 to $6.55	$5.65	$4.44
Normal forcing ability in per cent of rating	190	175	260	300–350	300
Price per maximum hp developable	$1.90	$2.06	$2.52	$1.88 to $1.62	$1.48
Maintenance per ton coal fired, in cents	10 to 12	11 to 14	6 to 10	2.5 to 4	4 to 6
Attendance in man-hours per active hour	0.45	0.45 to 0.50	0.20 to 0.30	0.08 to 0.10	0.30 to 0.40
Lb coal per sq. ft. grate surface (maximum)	35 to 38	35 to 42	45 to 48	60 to 75	50 to 65

effectively and less loss due to incomplete combustion results. Clinker troubles are reduced as the grates are entirely cleared of ash and clinker and cooled by re-

turning on the under side once every revolution. Chain grates weigh more per boiler-horse-power than other types, sometimes over twice as much as slope or underfeed grates. Having larger areas than other overfeed grates, however, chain grates can be forced much higher.

Underfeed Stokers

Underfeed stokers have the following principal advantages: The tuyères are covered with green or only partly coked coal so the grates are not liable to be burned; practically the entire furnace area is utilized to distil volatile matter; all of the air supplied to the furnace is immediately and intimately mixed with the volatile matter while it is still in the coal bed; the combustible gases pass through the hottest zone of the fire before reaching the furnace, and no arches are required. These stokers necessarily operate with forced draft as the air openings are restricted and the fuel bed is deep. As no arches are required, considerable expense is eliminated in repairing brickwork.

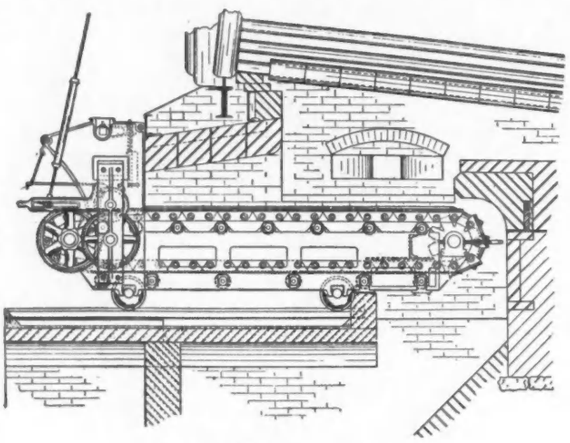


FIG. 2—CHAIN-GRATE STOKER

Stokers Compared

From the accompanying table showing the relative characteristics of mechanical stokers it can be seen that of the overfeed types the chain-grate stoker can be forced the most, costs the least to maintain and requires the least attention. This grate is also superior for burning highly volatile fuel containing considerable ash. For other kinds of coal the gravity-underfeed type is best, and it will probably be used eventually for all classes of fuel. It can be forced to operate at 300 to 350 per cent of its rating, costs only $1.62 to $1.88 per maximum boiler hp which it will develop, requires only 0.08 to 0.10 man-hour attendance per hour of operation, will burn 60 lb. to 75 lb. of coal per square foot of grate surface per hour, and can be maintained for 2.5 to 4 cents per ton of coal fired.

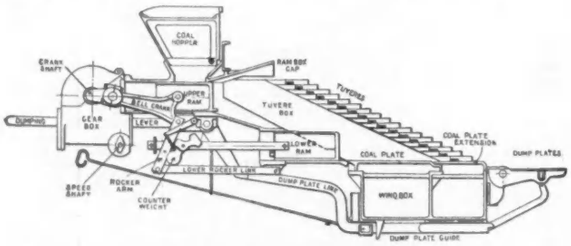


FIG. 3—UNDERFEED STOKER

The efficiencies of modern stoker installations are shown by the accompanying curves. These indicate boiler efficiency alone and do not allow for steam consumed by auxiliaries such as blowers, stokers and boiler-feed pumps. In general the best efficiency is shown when the boiler is operated at less than 100 per cent rating. Curves *A* and *B* indicate an exception to this statement. As the net output of steam for a given coal input is affected relatively more at low loads than at high loads by the steam consumed by the auxiliaries, it is advisable to operate the boilers at about 25 per cent higher than their most efficient rating as shown by the curves to obtain the best plant efficiency. The principal factor influencing the load to be carried by a boiler is the relation between fixed and operating costs. Forcing a boiler, however, will tend to deteriorate the furnace walls faster.

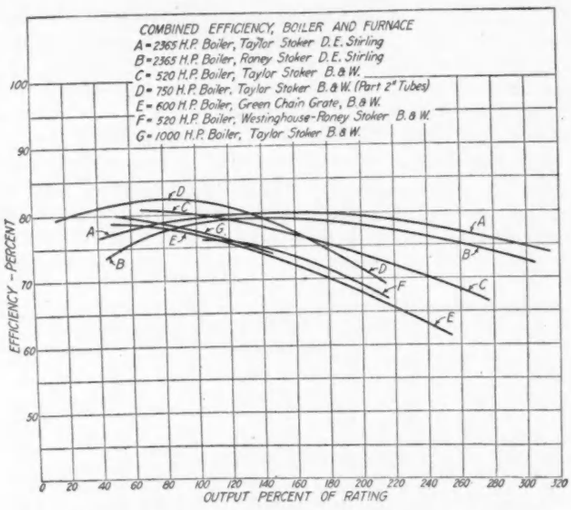

COMBINED EFFICIENCY, BOILER AND FURNACE
A = 2365 H.P. Boiler, Taylor Stoker D.E. Stirling
B = 2365 H.P. Boiler, Roney Stoker D.E. Stirling
C = 520 H.P. Boiler, Taylor Stoker B.&W.
D = 750 H.P. Boiler, Taylor Stoker B.&W. (Part 2" Tubes)
E = 600 H.P. Boiler, Green Chain Grate, B.&W.
F = 520 H.P. Boiler, Westinghouse-Roney Stoker B.&W.
G = 1000 H.P. Boiler, Taylor Stoker B.&W.
EFFICIENCY - PERCENT
OUTPUT PERCENT OF RATING

FIG. 4—EFFICIENCY CURVES FOR VARIOUS STOKERS

Increasing Plant Efficiency with Low-Pressure Turbines

In our plant the generators and auxiliaries are at present driven by non-condensing reciprocating engines. Could we increase the economy very much by replacing the auxiliary drive with motors and by installing low-pressure turbine-generators utilizing the exhaust steam from the high-pressure units? G. G. H.

Such a change is not always justified, as it involves the maximum investment with little gain in plant efficiency. A much better plan would be to use the apparatus now installed and utilize all of the exhaust steam to heat the boiler-feed water and operate a low-pressure turbine-generator for supplying energy to station lamps and motors and for assisting on peak loads. With the arrangement as suggested in your question, energy for operating the auxiliary motors would have to be supplied through the generator leads, transformers and feeder cables, thereby losing energy in each and cutting down their net load-carrying ability. If the existing equipment is used, the auxiliary engines will not have to be discarded, additional feeder and switching equipment will not have to be installed, and the only expense will be for the low-pressure turbine. Where the supply of exhaust steam is intermittent it may be advisable to install a regenerator, but it should not be required to carry peak loads for more than a few minutes, as interest charges on the investment may overbalance the cost of supplying live steam to the low-pressure turbine. Moreover, the probabilities are that, owing to the change in load, the boilers would be blowing off and thereby wasting steam which might be utilized as suggested.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Transformers.—E. A. H. DINHAM-PEREN.—A paper read before the South African Institute of Engineers in which the author deals with the more important points in the selection, installation and operation of transformers used for supplying three-phase energy from a three-phase system.—London *Electrician,* Oct. 2, 1914.

Large Induction Motors.—G. MOORES.—The first part of an illustrated article on some features of the mechanical design of large induction motors. In the present instalment the author deals with the general arrangement and ventilation.—London *Elec. Review,* Oct. 2, 1914.

Permitted Temperature Rise.—H. M. HOBART.—The author gives a convenient table showing, for various kinds of machines, the limits for the "observable" temperature rise prescribed in the standardization rules of the American Institute of Electrical Engineers.—*Gen. Elec. Rev.,* October, 1914.

Mercury Vapor Converter.—J. EPSTEIN.—An illustrated translation in abstract of his recent German article on working tests of a single-phase mercury converter.—London *Electrician,* Oct. 2, 1914.

Lamps and Lighting

Manufacture of Incandescent Lamps.—The manufacture of the half-watt lamp at the works of the British Thomson-Houston Company is described in the London *Electrical Engineering* of Sept. 17. The methods of manufacture at the Osram lamp works and at the Ediswan works are described in the London *Electrical Engineering,* Sept. 24, 1914.

Line Voltage and Lamp Voltage.—M. D. COOPER.—An article on the economic significance of the relation between line voltage and lamp voltage. The author finds that the rated voltage of incandescent lamps is on many occasions not the most economical value of electric pressure to apply. After a detailed discussion of the many factors influencing the quality and cost of electric energy, the author describes several cases in which all persons concerned were benefited by lamp operation at a slight over-voltage, or at least not below rated voltage. To substantiate the argument presented in favor of an over-voltage operation, the author concludes with facts taken from electric census reports, which show that the tendency of practice has been in this direction for a number of years.—*Gen. Elec. Rev.,* October, 1914.

Generation, Transmission and Distribution

Calculation of Voltage Regulation on Long Three-Phase Transmission Lines.—B. SOSCHINSKI.—The author discusses the method of maintaining the voltage at the end of a transmission line constant by adjusting the power-factor by means of synchronous motors at the end of the line. The author gives the formulas for the calculation of the voltage drop and the wattless volt-amperes. By means of examples it is shown that the extra expense is warranted and that certain essential advantages are obtained in operation.—*Elek. Zeit.,* Sept. 10, 1914.

Rating of Motors.—H. M. HOBART.—A summary of the reasons why various electrical associations have agreed to specify that all electric motors should be rated in kilowatts instead of horse-power.—*Gen. Elec. Rev.,* October, 1914.

Traction

Crank Drive in Electric Locomotives.—J. BUCHLI.—An illustrated translation in abstract of his German article in which the author investigates the source of the mechanical troubles in electric locomotives and finds that the play in the bearings may give rise to resonance oscillations owing to the "static indeterminateness" of the transmission through driving rods. Means for overcoming the trouble are discussed, and reference is made to the improvement in the Lötschberg locomotives.—London *Electrician,* Oct. 2, 1914.

Railway Signaling.—H. M. JACOBS.—His second article on the subject. The author deals with automatic block and interlocking signals, the former being installed along the right-of-way, while the latter are placed at terminals, cross-overs, etc., and are controlled from towers. The automatic block signals are built for operation on alternating-current and direct-current circuits, the direct-current signals receiving their current in most cases from storage batteries at convenient points along the route, while the alternating-current signals are supplied with energy from transmission lines. The interlocking signals are either manually operated or are controlled through electric-pneumatic or all-electric devices.—*Gen. Elec. Rev.,* October, 1914.

Installations, Systems and Appliances

Starting Rotary Converters.—E. P. HILL.—An article on precautions in starting rotary converters from transformer tappings. The method of starting by low-voltage taps from the transformer is applicable only to machines up to about 300 kw, the difficulty on larger sizes being the disturbance of supply from the large watt-

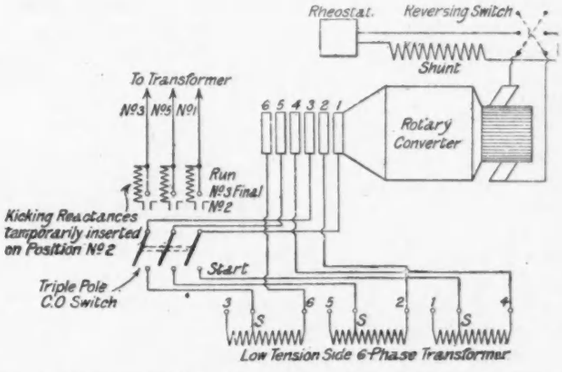


FIG. 1—CONNECTIONS FOR TAP STARTING OF SIX-PHASE ROTARY CONVERTER

less current drawn during the initial starting period. There is, in addition, the trouble that the polarity to which rotary converters will build up is subject to no control whatever and must be reversed should it build up incorrectly. This latter point is in practice not productive of much difficulty, as a field change-over switch can be used, and there is, in addition, always the possi-

bility of opening the main switch momentarily or rapidly reversing the polarity by slipping a pole. The main poles of the converter are fitted with grids, which act as the squirrel-cage rotor of an induction motor and, together with the iron loss in the pole shoes, produce sufficient torque to bring the armature up to approximate synchronous speed. When the field switch is closed, the machine builds up and pulls into step on the low-voltage side of the change-over switch, and on the switch being thrown over full voltage is applied, the rush of current being controlled entirely by the amount of reactance in the transformer circuit. Should the machine be fitted with commutating poles, it is necessary to short-circuit their coils during starting to prevent the rotary "locking" at half-speed; that is, behaving as if it had twice its real number of main poles. If this precaution be neglected, a much slower start obtains, and sparking trouble occurs on the direct-current brushes. Again, the fact that the machine is running at only half speed may easily be overlooked, and on switching over after the usual lapse of time a flash-over occurs. It is advisable to wait on the starting side until the phase swinging dies down before changing over. Frequently surges in the supply (especially in traction circuits) cause a few seconds to elapse before a steady condition is reached, and after being instructed an attendant, by the characteristic note, can tell when the time for switching over has arrived and thereby avoid a flash on the commutator and other ill effects. When the machine has to meet stringent guarantees of voltage regulation and efficiency, the reactance necessary to limit current rushes has to be temporarily inserted during starting period by a kicking contact on the change-over switch, as shown in Fig. 1, and attendants are tempted to throw over the switch on to the final position without pausing, as is intended, on the kicking contact. A stop is sometimes provided to insure correct working, but some makers prefer to leave this to the discretion of the attendant in case he should, by the use of the stop, burn out the grid resistors. A pause of from one to two seconds should be made on the kicking contact, when it will be found that a very satisfactory start results. The brush friction loss of tap-started converters has considerable influence on the time taken to come up to speed. An unskilled attendant becomes much alarmed by the fact that the machine will not come up to speed, whereas wiping the commutator with a little lubricant will at once rectify matters. Too heavy brush tension or a rough commutator will cause this trouble, but probably the transformer tap is too low when this symptom appears.—London *Elec. Eng'ing*, Oct. 1, 1914.

Wires, Wiring and Conduits

Rating of Bare Copper Conductors. — W. COATES. — American and German firms have mostly adopted a temperature rise of 30 deg. C. as standard for switchboard connections. British builders are usually more conservative, and work to a limit of 20 deg. C. The author gives tables for the maximum permissible direct-current load in amperes for temperature rises of 20 deg., 30 deg. and 40 deg. C. Three tables are given—the first for single copper strips, the second for copper strips in parallel at different spacings, and the third for round copper rods.—London *Elec. Review*, Sept. 18, 1914.

Switches.—H. G. FRENCH.—An illustrated article on some recent developments in lever and disconnecting switches.—*Gen. Elec. Rev.*, October, 1914.

Electrophysics and Magnetism

Quantum Theory.—S. DUSHMAN.—In his third paper on recent views on matter and energy the author discusses various applications of the quantum theory.—*Gen. Elec. Rev.*, October, 1914.

Units, Measurements and Instruments

Adjustments of the Thomson Bridge in the Measurement of Very Low Resistances.—F. WENNER AND E. WEIBEL.—An illustrated description of two new procedures for carrying out those adjustments which make the correction terms of the Thomson bridge equation negligibly small. Both procedures require the use of a variable double ratio set (so adjusted that for any reading of the dial switches the lack of equality of the two ratios α β—Fig. 2—is so small that no appreciable

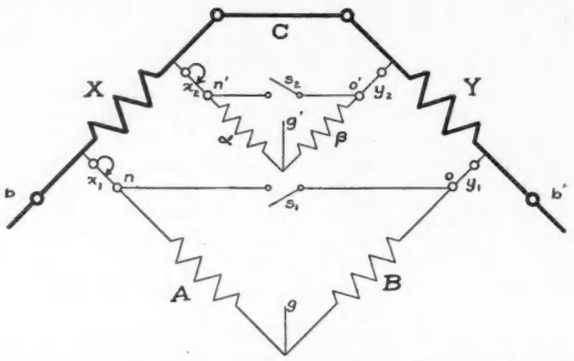


FIG. 2—THOMSON BRIDGE EQUIPPED TO MEASURE VERY LOW RESISTANCES

error is introduced on this account) and variable low resistance to be used in the connections x_1 and x_2 between the terminals of the ratio set and the potential terminals of the four-terminal conductors under comparison. (1) With the test current supplied through the terminals b and b', the bridge is balanced by an adjustment of the dial switches of the double ratio set. (2) With the test current supplied through the terminals n and o, the bridge is balanced by an adjustment of the variable low resistance forming a part of x_1. (3) With the test current supplied through the terminals n' and o', the bridge is balanced by an adjustment of the variable low resistance forming a part of x_2. (4) With the test current supplied through the terminals b and b', the bridge is balanced by an adjustment of the dial switches of the double ratio set. In the other procedure the test current is supplied through the terminals b and b' only, but means are provided for connecting the terminals n and o and n' and o' by conductors of low resistance. The adjustments are made in four steps, of which (1) and (4) are the same as given above. In (2) the terminals n and o are connected, while the bridge is balanced by an adjustment of x_1, and in (3) the terminals n' and o' are connected while the bridge is balanced by an adjustment of x_2. Either procedure gives very accurately $x = ay/b$ where x and y are the resistances of the four terminal conductors under comparison and A and B are the resistances between n and g, and g and o, when the final adjustment is made. Both procedures differ from those previously used mainly in that they do not require changing over to a simple bridge by opening the low-resistance connection between the resistances under comparison. Where the resistances under comparison and the resistance of the connection between them are very low it is more or less impracticable to change over to a simple bridge during the adjustments. In such cases procedures have been found more satisfactory.—*Journal Wash. Acad. of Sciences*, Oct. 4, 1914.

Use of Thermo-Electric Apparatus in High-Frequency Systems.—AUGUST HUND.—This paper deals with thermo-electric phenomena and shows their application to technical apparatus. The scope of the paper is to show the use of certain apparatus which may be built very readily for laboratory purposes and which are

very convenient for measuring currents up to the highest frequencies independently of the shape and length of wave.—*Gen. Elec. Rev.*, October, 1914.

Effect of Wave-Form on the Readings of Moving-Iron Instruments.—R. B. BURROWES.—An investigation as to what difference, if any, a moving-iron instrument indicates for currents having the same root mean square values but of different wave forms. With this object in view experiments were made on a switchboard type of ammeter working on the above principle, the range being from 0 amp to 10 amp, the scale divisions at the lower end being crowded. The following effects were investigated: shape of *B-H* curve for the moving iron, effect of hysteresis, effect of ripples, and effect of frequency. The results are given in diagrams and tables. —London *Electrician*, Oct. 2, 1914.

Refractometry.—G. A. SHOOK.—His second article on the subject illustrated by diagrams. The author discusses the instruments of Butyro, Abbe, Zeiss, Pulfrich and Féry, and their availability and suitability in different cases.—*Met. and Chem. Eng'ing*, October, 1914.

Telegraphy, Telephony and Signals

Frequency-Increasing Apparatus.—A note on a recent British patent (No. 13,637, 1913) of the Marconi Wireless Telegraph Company, Ltd., and C. S. Franklin. The source of alternating current the frequency of which it is desired to increase is connected in series with a rectifier and a polarizing direct voltage of requisite strength, which may be in the same direction as, or opposed to, that half of the current which normally passes through the rectifier. The rectified current is led through the primary of a suitable transformer, having a secondary connected to a capacity, and tuned to have a time period equal to half that of the original voltage. The frequency of the induced voltage in the secondary will then be double the original frequency. By using two or more transformers with primary and secondary circuits suitably arranged, higher transformation ratios can be obtained. During operation the battery which is used to supply the polarizing voltage may become charged, and the surplus energy can be utilized to help drive the alternator through a motor. The apparatus is, of course, particularly adapted for producing high-frequency oscillations for wireless signaling.—London *Elec. Eng'ing*, July 9, 1914.

Capacity of Wireless-Telegraph Antennas.—G. W. O. HOWE.—The first parts of a paper read before Section G of the British Association at the recent meeting in Australia. The capacity considered in this paper is the actual static capacity, and not the equivalent capacity of the antenna considered as part of an oscillatory circuit. When raised to a potential above or below that of the earth the charge is distributed over the antenna in a way which is not easy to calculate but which must be such that all parts of the antenna are at the same potential. If the antenna were made up of a great number of short pieces, placed end to end but insulated from each other, it would be possible to distribute the charge uniformly, but the potential would then vary from point to point in a way which is easily calculated. If now we assume that all the separate pieces of wire are connected, electricity will flow from points of high to points of low potential until the potential is everywhere the same. The assumption made in developing the various formulas is that this final uniform potential is equal to the average value of the potential when the charge was uniformly distributed. This is only approximately correct, but the accuracy is more than sufficient for all practical purposes. This method has been applied to antennas of all the types usually employed.—London *Electrician*, Aug. 28 and Sept. 4, 1914.

Miscellaneous

Lightning Protection of Buildings.—JOSEPH MAYER. —A discussion of the regulations for the protection of buildings against lightning flashes. To distinguish between the suitability of the different lightning-rod systems it is not only necessary to study systematically the damage done by lightning but also to observe carefully the secondary phenomena (induction phenomena, expansion of air, etc.) which accompany the lightning flashes.—*Elek. Zeit.*, Sept. 10, 1914.

Electrical Industry of Austria and Hungary.—E. HONIGMANN.—A review of the conditions of the electrical industries of Austria and Hungary during the first half of the year 1914. Although there had been a decline of commercial activities at the end of 1913, the electrical manufacturing companies were able to pay very satisfactory dividends.—*Elek. Zeit.*, Sept. 10, 1914.

Book Reviews

ECONOMICS OF BUSINESS. By Norris A. Brisco. New York: The Macmillan Company. 390 pages. Price, $1.50.

The author combines a general study of efficiency methods with his discussion on the economics of business. He speaks of the factory as the center of investigation and study and of the waste of time, energy and material revealed. He regards as the most significant of the contributions to literature on business those which have been made by successful business men who recounted their own experiences, pointed out the broad principles to be derived therefrom and explained the methods by which the principles may be applied. From an analysis of such data and from a study of the methods of many successful business enterprises, the fundamental principles underlying business have been produced. The book has been written to give expression to these principles, and the author has packed a surprising amount of information into one volume.

THE MANAGEMENT OF PUBLIC ELECTRIC SUPPLY UNDERTAKINGS. By A. Hugh Seabrook. New York: McGraw-Hill Book Company, Inc. 212 pages. Price, $2.50.

The subject of management, whether of public electric supply undertakings or of any other organized business, is not easily dealt with in a written treatise. Given the right man at the head of a business, its success is generally assured; but a schedule of the qualities and idiosyncrasies of such a man is not easily made, neither is it of much practical value when made. Again, details of organization, office and works routine, systems of charging and of account keeping, although of indisputable value, cannot alone determine the success or otherwise of a business undertaking. Mr. Seabrook, whose experience and position entitle him to an attentive hearing, handles his subject in the manner of a broad-minded man with high ideals and a sense of justice, without which no man can conduct a successful business of a permanent nature. Leaving out of account the fact that the benefit to be derived from a book of this nature is a factor of some uncertainty, this particular volume stands undoubtedly in the front rank. The chapter on tariffs and methods of charging is well worthy of study by American readers. This and the more general discussion of the problems of management, in which the writer expresses his views clearly, without reserve or hesitation, are perhaps the parts of the book most valuable to the reader who is not making a very detailed study of the subject.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Small Scoop Reflector for Showcases

The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has brought out a small scoop fixture for illuminating showcases which does not present much obstruction to the view, consumes very little energy, affords an even distribution of light, does

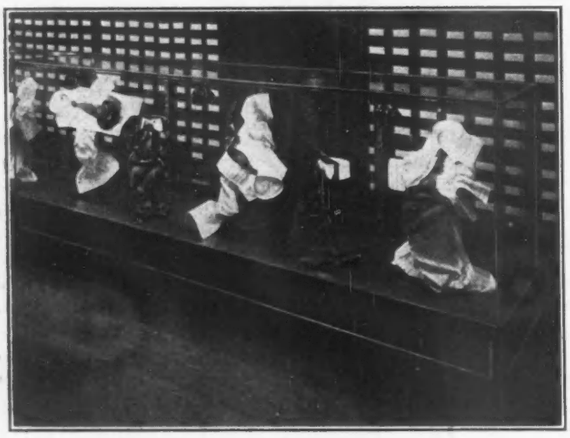


FIG. 1—SHOWCASE EQUIPPED WITH SCOOP REFLECTORS

not heat the showcases appreciably, is relatively inexpensive to maintain in operation, and conceals the lamps from the eyes of the customers and clerks. The reflector, lamp and socket are inclosed in a neat brass housing which is attached to a 0.375-in. brass conduit

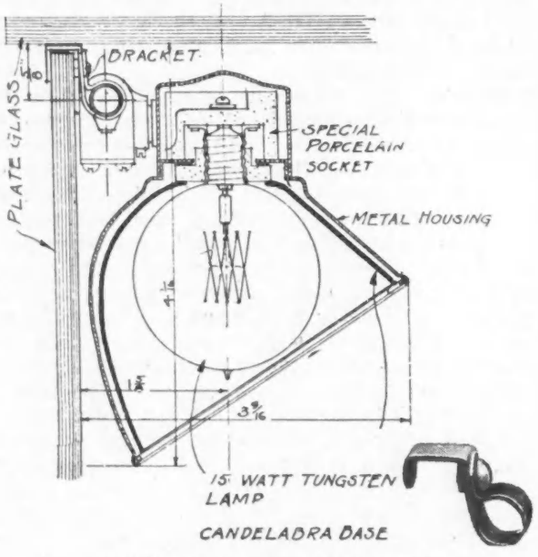


FIG. 2—DETAIL OF SCOOP FIXTURE

running along the upper outside edge of the showcase. A 15-watt round-bulb candelabra-base tungsten lamp is employed. The socket is consequently small, making the entire unit extend only 4 in. from the top of the case and occupy only 3 in. in width. The "scoopette," as it is called, produces even, intense illumination from the topmost shelf of the case to the lower edge of the front glass. The reflectors can be cleaned without removing the lamps, and all parts can be easily dusted. It is declared that fewer lamps with lower rating need be employed to illuminate a case when these fixtures are used; therefore the amount of heat generated is low. For installing the scoopettes and connecting them with floor receptacles the manufacturer has developed a complete line of standard equipment, including junction boxes, tubing, elbows, offset fittings, tubing caps, special porcelain sockets, metal housings, etc. Besides being adapted to showcase lighting, they can be employed in small and unusual-shaped windows, for pulpit, bed and chair reading lamps, and for bulletin-board, picture, sewing-machine and gage illumination.

Rigid Protector for Linemen

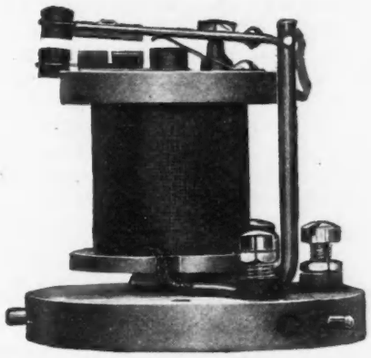
The Withers lineman's protector, which is being introduced by the Associated Engineers' Company, 180 North Dearborn Street, Chicago, forms a rigid shield

RIGID PROTECTOR FOR USE OF LINEMEN

which rests on the cross-arm and incloses the conductor with a 3-in. air space on all sides, thus gaining the advantage of this dielectric protection in addition to the insulating value of its own 0.375-in. rubber-composition walls. As shown in the illustration, the under side of the protector is open, allowing it to be quickly dropped over the wire, which is slipped into the end sockets securely fixing it in place, so that the guard cannot be loosened by wind or by the weight of the lineman's body. All weight is, of course, borne by the cross-arm on which the shield rests, and the lower edge is adapted for seating on both single and double arms. The protector is of molded rubber composition, without metal in its construction. Its weight is about 12 lb., and it can be dropped from a pole without injury. Slotted flexible tubes can be slipped over the conductors, thus extending the range of safety protection. These tubes are furnished with the protectors, and the protectors themselves can be furnished in successive sizes arranged to "nest" in order to economize space on the line wagon.

Automatic Cut-Out

An automatic cut-out designed for use with automobile or motor-boat lighting outfits to make the circuit when the generator is running and break it when the generator stops, thus preventing the discharge of the

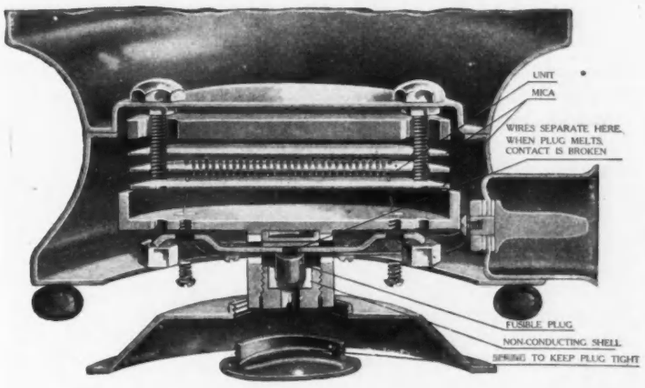


CUT-OUT FOR AUTOMOBILE LIGHTING OUTFIT

battery back through the generator, is shown in the accompanying illustration, which is two-thirds the actual size of the device. A primary shunt coil on the generator circuit operates the armature as soon as the voltage reaches the proper value and makes connection through the carbon contacts. As soon as these connections are made a series coil is thrown into the circuit, and the armature is held down by a sliding contact. When the generator stops the line circuit is opened by a spring. This device has double contacts of carbon and bronze and is entirely inclosed in a stamped-steel case, which is attached by a bayonet lock to the heavy fiber base. The outside dimensions are 2.75 in. by 2.75 in. The Carleton Company, 170 Summer Street, Boston, Mass., is the manufacturer of this cut-out.

Fusible-Plug Safety Device for Water-Heating Appliances

A fusible-plug safety device for use on appliances employed in heating water such as percolators, samovars, chafing dishes, etc., is being made by Landers, Frary & Clark, New Britain, Conn. If the water in the receptacle is exhausted while the circuit is closed and the



SECTIONAL VIEW OF HEATING UNIT WITH FUSIBLE PLUG

device consequently is overheated, in about a minute, before any harm can result, a plug melts and the circuit is opened. A new fuse can be inserted in a very short time. In the accompanying illustration is shown a sectional view of the device attached to the receptacle, the various parts being separated. The heating wire is of nichrome and is wound around mica into uniform grooves. It is made fast by insulating cement. Mica disks are placed above and below the unit as shown. Heat is distributed uniformly by means of a flanged plate beneath the unit. The heat expands this plate and forces the flange tight against the water compartment.

Drink Mixer Illuminating Contents of Glass

Illustrated herewith is a drink mixer which is set in operation by a switch knob and button on the agitator shaft. When the shaft is revolving the base and contents of the glass are illuminated, giving a pleasing color effect which may be employed to attract attention to some advertisement. A universal-type motor is employed. All parts of the device are standardized and therefore interchangeable. The outfit is shipped knocked down to prevent breakage in transit, but no

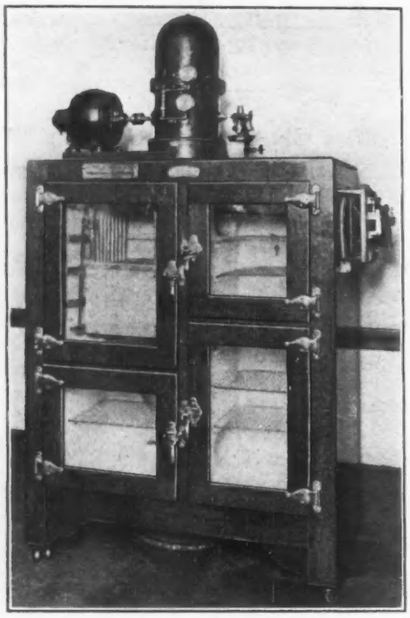
ELECTRIC DRINK MIXER

tools are required to assemble it. The mixer is manufactured by the Wisconsin Electric Company, whose works are at Racine, Wis.

Domestic Refrigerating Equipment

Exhibited in operation at the recent electrical exposition in New York City was the domestic refrigerating outfit shown in the accompanying illustration. Under actual test, it is declared, the machine produced 100 lb. of ice with an energy consumption of only 2.5 kw-hr. At a rate of 10 cents per kw-hr. ice can, therefore, be made for 25 cents per 100 lb., which is very economical for a small machine. Although the manufacturers, Westerberg & Williams, Woolworth Building, New York City, have not yet placed the apparatus on the market, they intend doing so soon. They purpose making two sizes, one with a rating of 150 lb. a day for apartments and small houses, and the other with an output of 300 lb. a day for large residences. The equipment is designed to fulfill the exacting requirements of household refrigerating service where no trained labor is available for tending the machine. It is planned to make the initial cost low enough to be within the reach of the average family. During the exposition, which lasted from Oct. 7 to 17, the plant operated continu-

ously, maintaining a temperature of 28 deg. to 33 deg. Fahr., and simultaneously making 12 lb. of ice in four blocks. The compressor was driven by a 0.25-hp motor. Its operation is entirely automatic, the starting and

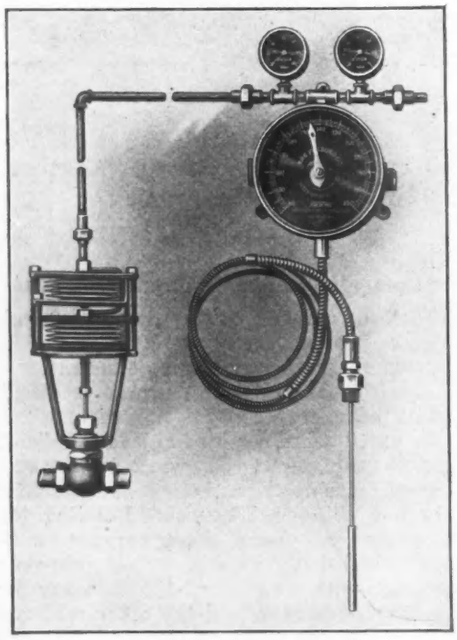


REFRIGERATOR EQUIPMENT FOR DOMESTIC USE

stopping taking place in response to the temperature of the refrigerator.

Temperature Regulator

A temperature controller which is declared to be extremely accurate and reliable has been placed on the



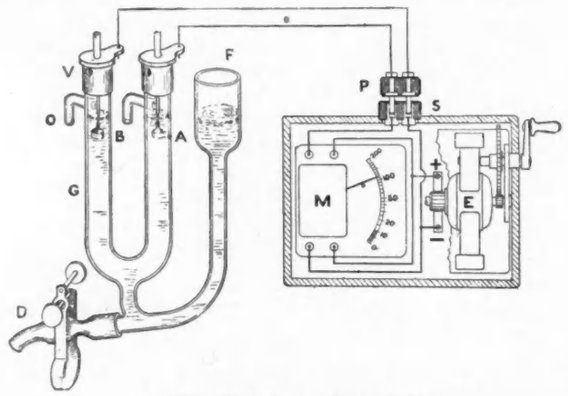
TEMPERATURE CONTROLLER AND DIAPHRAGM VALVE

market by the Industrial Instrument Company, Foxboro, Mass. The entire equipment required for temperature regulation which is shown in the accompanying illustration includes two gages, the controller and bulb, and the diphragm valve. Either vacuum or pressure may be employed to operate the valve, which is made entirely of metal and is therefore practically indestructible. If the vacuum system is used, no moisture will collect in the piping, whereas it may do so if the pressure system is employed. The gage at the right indicates the pressure maintained in the supply system, and the one at the left shows the pressure operating the valve. If the pressure or vacuum fails, the valve will close automatically, thus preventing the overheating which might otherwise occur. The valve inside the controller case which determines the position of the diaphragm valve is controlled by a helical spring similar to that employed in recording thermometers made by the Industrial Instrument Company.

Water Testing with Electrical Apparatus

An apparatus for determining the degree of hardness of water and the amount of impurities in distilled water and of sewage in rivers, etc., has recently been developed. The operation of this apparatus is based on the principle that the conductivity of water containing any electrolytic substance in solution is due almost entirely to the dissolved substance.

The complete apparatus is shown in the accompanying diagram, *G* being a bent glass tube containing the



WATER-TESTING APPARATUS

water under test, and *A* and *B* the electrodes for passing the electric energy through the water. The electrodes are connected by wires to a generator *E;* by turning the handle *W* energy is generated and is made to flow through the meter *M* and the water in the conductivity tube *G*. The pointer of the meter is deflected and comes to rest at some point upon the scale which directly indicates the conductivity of the water in the tube. The test is completed as soon as the pointer has come to rest.

The electrodes are short, hollow cylinders of platinum. The water is poured into the funnel *F*. By allowing the water to overflow through the outlet pipes *O, O,* every part of the tube is washed and any products of electrolysis which may have accumulated upon the electrodes are removed. The air vents *V, V* insure a steady flow from each outlet without any siphoning action. A drain pipe *D* of rubber is provided at the bottom of the tube for drawing off the contents at the conclusion of the test.

The tube is mounted on a strong teak stand. The meter and generator are inclosed in a box which is sealed, a window being provided for observing the dial. The water-testing outfit described above is being placed on the market by J. G. Biddle, 1211 Arch Street, Philadelphia, Pa.

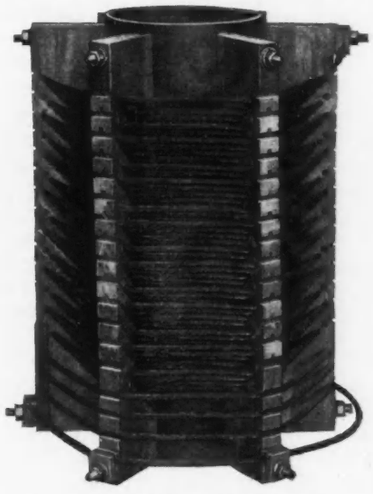
Composition Flush Receptacle

A compact shallow flush receptacle which is designed to fit any standard box has recently been developed by the Chelton Electric Company, 314 Armat Street, Philadelphia, Pa. Heavy long binding screws are employed. Not only is the cap of non-breakable composition, but the receptacle is also made of the same material. The plate is of brass and is beveled as shown in the accompanying illustration. The receptacle, plate and cap are interchangeable with similar types made by the above company.

FLUSH RECEPTACLE

Conical-Type Reactor

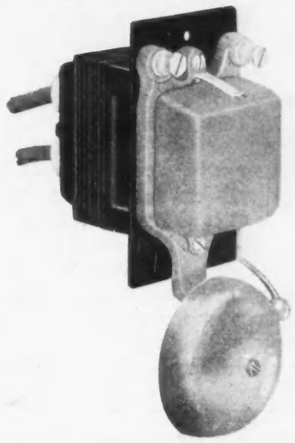
A reactor which is compact, has desirable dimensions and is held together radially by tension in the conductors is shown herewith. The central core consists of diagonal notched supports for the conductors, which are of stranded copper. With the cable in place the reactor consists of a series of conical, superposed coils separated sufficiently to prevent flash-overs due to increase in potential between layers when there is a current surge. The supports are held together by tongue and groove joints. Absence of longitudinal bolts, usually employed in reactors, increases the ability of this reactor to withstand surges and lightning discharges, it is declared. The General Electric Company manufactures the reactor.



CONICAL-TYPE REACTOR

Bell-Ringing Transformer

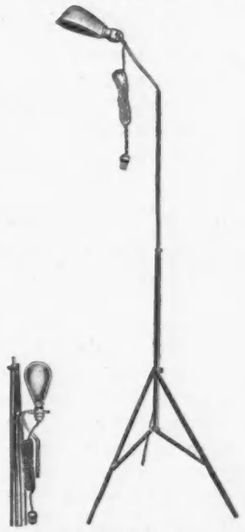
A bell-ringing transformer designed to fit standard single-gang switch boxes is shown herewith. This transformer is adapted for use in residences where it is desirable to place the device near the bell. The transformer plate is drilled and tapped to take any standard iron-box bell. It will also take a standard flush switch plate where it is desired to make the finish conform to the finish of the hardware. The coils are independently wound and are designed to withstand a 2500-volt insulation test between the primary and secondary and the primary and ground, also 1000 volts between the secondary and ground. The device is designed for operation at a frequency of sixty cycles, a primary emf of 110 volts and a secondary emf of 10 volts. This transformer is made by the A. E. Rittenhouse Company, Honeoye Falls, N. Y.



BELL-RINGING TRANSFORMER FOR RESIDENCES

Adjustable Stand-Lamp Fixture

A fixture for stand lamps which can be adjusted from a height of 2 ft. 6 in. to one of 5 ft. 6 in., and which can be folded up as shown in Fig. 1 when not in use, is being manufactured by the R. M. Millar Electric Works, 9 Clinton Street, Chicago, Ill. Although the weight complete is only 2.75 lb., the device is stable, the manufacturers declare, and cannot be easily tipped over. Finished in brush brass, it has a shade and reflector.

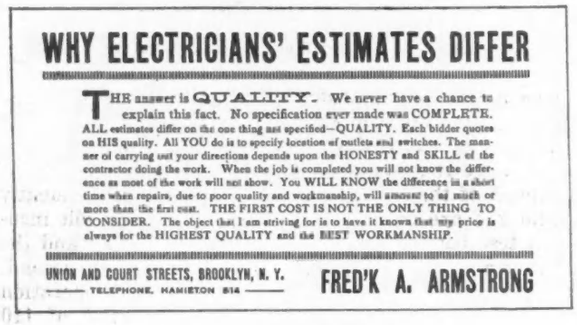


FIGS. 1 AND 2—LAMP FOLDED AND EXTENDED

Jobber, Dealer and Contractor

Quality in Contracting

If there is one phase of the electrical contracting business that has done more harm to the contracting trade as a whole than any other it is cut-throat competition. So loose-jointed is the electrical contracting business that a customer can with little difficulty play one contractor against another, seemingly to his own advantage. However, it is hardly natural to suppose that any contractor will continually do business at a loss, so that the only deduction to draw from an extremely low bid is that the work will be extremely low in quality. An enterprising electrical contractor of Brooklyn when making bids for electrical installations, while guaranteeing his own work, is careful to bring the quality of the work also to the attention of the customer. The accompanying illustration is reproduced from a blotter submitted by this contractor with all


WHY ELECTRICIANS' ESTIMATES DIFFER

THE answer is QUALITY. We never have a chance to explain this fact. No specification ever made was COMPLETE. ALL estimates differ on the one thing not specified—QUALITY. Each bidder quotes on HIS quality. All YOU do is to specify location of outlets and switches. The manner of carrying out your directions depends upon the HONESTY and SKILL of the contractor doing the work. When the job is completed you will not know the difference as most of the work will not show. You WILL KNOW the difference in a short time when repairs, due to poor quality and workmanship, will amount to as much or more than the first cost. THE FIRST COST IS NOT THE ONLY THING TO CONSIDER. The object that I am striving for is to have it known that my price is always for the HIGHEST QUALITY and the BEST WORKMANSHIP.

UNION AND COURT STREETS, BROOKLYN, N. Y.
TELEPHONE, HAMILTON 814
FRED'K A. ARMSTRONG

A BUSINESS-GETTING BLOTTER

bids. While it is within the bounds of reason that another contractor might do the same work at somewhat less cost and still not let the quality of the work suffer, it is improbable that a customer thus warned will slight the question of quality of the work. This would result in cleaner competition and business on a more profitable scale.

Central-Station Merchandising Methods

In a paper read before a recent meeting of the new-business men of the Ohio Electric Light Association, Mr. J. E. North, commercial manager of the Springfield (Ohio) Light, Heat & Power Company, defended the merchandising plans of central stations. From time to time there has been considerable discussion as to whether or not a central-station company should sell lamps, motors and appliances. Mr. North, while not attempting to advise the larger central stations, in his own case considered it extremely advisable not only to sell the various articles but to sell them at a profit, because a net income from sales has a wonderful effect upon the net cost of the sales department. In his case the sales expense is reduced nearly 50 per cent. Mr. North does not think that there is a large objection to central-station companies selling motors and appliances so long as such sales are made at a profit, and he believes that the contractor or electrical-supply man is justified in complaining when central-station companies sell these articles at cost. Mr. North said:

"In the smaller city it seems that the supply people are not in a position to handle a large volume of appliance business. It probably could be done, but it seems that the necessary effort is not put forth. The average small supply dealer's window appears as though the toasters, irons, motors and wiring supplies had been put in the window with a shovel. Special attention should be given to windows to make them present an attractive appearance. The best evidence that can be produced in favor of a central-station company selling lamps and appliances is the fact that the Springfield company's profit on sales for the first seven months of this year reduced the cost per kilowatt contracted from $2.76 to $1.51 and reduced the cost per contract from $3.37 to $1.92. The solicitors employed by a company selling appliances have an advantage over the solicitors of a company which does not sell appliances. If the solicitor understands that he is expected to contract for a certain amount of business to justify the salary he is receiving, or if he understands that the business contracted is not to exceed a certain cost per kilowatt, it is possible for him to make sufficient sales to keep the cost for new business normal, and it is not uncommon for a solicitor's salary to be paid from a profit on sales."

Concentrated Purchases by Electrical Contractors

At the convention of the Electrical Contractors' Association of Massachusetts which was held at Worcester, Mass., recently, Mr. W. K. Tuohey, of Springfield, Mass., now president of the association, brought out the possibilities of economy through the concentration of purchases by electrical contractors. He contended that as jobbers in the plumbing supply trade refuse to sell to any but master plumbers with thoroughly satisfactory results, a similar policy might be tried to advantage in the electrical contracting field. Good will for one's competitor, charity toward his faults and a helping hand to assist him on his way will accomplish wonders for the industry, he said.

Responsibility in Freight Shipments

In the shipment of goods by electrical jobbing houses and others misunderstandings sometimes occur in placing the responsibility for damages resulting during transit. The responsible jobber uses, of course, the greatest care in packing his shipments and in routing them to the customer. In many houses all goods are "checked" twice and a printed slip is packed inside the box listing all articles contained in the case or package. But for damages occurring to shipments during transit the railroad company must be held responsible, for when shipment is made "f.o.b." at the shipper's freight station the goods technically become the property of the customer when they are delivered to the transportation corporation. Following is the text of a notice which has been sent out among the Middle West trade and which states clearly the rules of practice as they affect shipper, railroad company and consignee:

"Where goods are sold delivered free on board cars at point of shipment, the ownership passes to the customer when goods are delivered to the railroad and shipper has obtained receipt from the railroad.

"Shipper has no control over the method of handling goods after they are delivered to the railroad, and customers therefore must file with their local freight agent any claims for shortage or damage in transit.

"If shortage exists or packages appear damaged, have agent make proper notation on freight bill before you pay it. If external appearance of package is good but contents are damaged, notify freight agent to send at once an inspector, who should be required to make a notation of facts on your freight bill. The law requires that all claims for loss or damage must be made in four months from date of shipment, or otherwise the railroad cannot be held for damages."

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Small Steam Lighting Outfit.—What is said to be the smallest steam generating outfit built for practical purposes was recently made by the Westinghouse Electric & Manufacturing Company for the lighting of a small tug in New York. The machine can easily be placed in a wheelbarrow. It is 35 in. long, 17 in. high and 14 in. wide.

Dimming Devices Being Exported.—The Wirt Company, Germantown, Philadelphia, is exporting over 25 per cent of its product and its dimming devices are being sent to practically every foreign country where electricity is used for domestic lighting. The device is a small compact rheostat which fits into a lampholder or chandelier socket and is used to modify the intensity of light.

Orders for Electric Cranes.—The Cleveland (Ohio) Crane & Engineering Company has recently received orders for its electric traveling cranes from the following companies: The William Wharton, Jr., Company, Philadelphia, Pa.; the Pennsylvania Steel Company, Harrisburg, Pa.; the Bollinger-Andrews Construction Company, Josephine, Pa., and the Ford Motor Company, Detroit, Mich.

Quick Performance of Transformer Manufacturer.—The Packard Electric Company, Warren, Ohio, recently received a rush order from the Bliss & Van Auken Lumber Company, Saginaw, Mich., for two special 50-kw, sixty-cycle transformers to be designed for 2300 volts on the primary side and 600 volts on the secondary side. This order was received Monday noon, Sept. 21, and on Saturday morning, Sept. 26, the two units were delivered complete to the lumber company.

Electric Trucks for England.—Mr. E. J. Bartlett, manager of the truck department of the Baker Vehicle Company, recently returned from England and brought with him an order for twenty electric trucks from an English firm. Because of the fact that most of the gasoline trucks have been commandeered by the English government for use by the army, electric vehicles are being substituted. The unusual conditions brought about by the war have increased the opportunities of the electric-vehicle manufacturers not only in England but in the continental countries of Europe as well.

Ball Bearings from Germany.—In spite of the European war and the temporary suspension of shipments from German ports, the Hess-Bright Manufacturing Company, Philadelphia, Pa., is receiving large quantities of ball bearings from its factory in Berlin via neutral countries. Since Sept. 1 more than 125,000 ball bearings of various sizes have been received. The above company was fortunate to have a large supply of ball bearings on hand when the war broke out, which added to the increased output of the factory in Philadelphia and the importations from abroad has easily enabled the company to take care of all orders and provide adequately for new business.

Electric Company's Foreign Trade Falling Off.—The Pittsburgh Electric Specialty Company's foreign trade has decreased considerably on account of the present unfavorable conditions abroad. The company has some 350 agencies in various parts of the world. Recently shipments were made to England. In this country the company is more than holding its own. It is getting out a number of new electric devices which are meeting with favor as Christmas gifts. One of these is a light vacuum cleaner with a complete set of attachments at a rather low price. Another popular appliance is a small electric stove and a luminous toaster. Articles suitable for Christmas presents are being packed in attractively decorated boxes.

Electric Blowers for "Unit Orchestras" and Organs.—As a result of the increasing demand for mechanical musical instruments in theaters and music halls, the Kinetic Engineering Company, Philadelphia, Pa., is selling a large number of its electrically operated blowers for organs and so-called "unit orchestras." The blower manufactured by the above company consists of several fans mounted on the same shaft and operated in series, each fan adding to the pressure created by the previous fan, thus raising the pressure step by step to the highest required. Among the manufacturers of pianos using this blower are the Rudolph Wurlitzer Company, the J. P. Seeburg Piano Company and the Peerless Piano Company. For "unit orchestras" motors rating as high as 35 hp are used. If necessary, the blower can be designed to create both a suction and a blowing action. The demand for a motor-driven blower for use with church organs is also quite large.

Latin-American Trade Situation.—That the Latin-American countries are looking to the United States for the capital and the market for their products which they formerly found in Europe is emphasized in "Statements on the Latin-American Trade Situation," a pamphlet just issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce, giving the addresses made by representatives of Latin-American countries at a conference with American business men recently held in Washington. The pamphlet contains the statements made by the ministers from Bolivia, Uruguay, Peru and Cuba to the United States, the consuls-general of Costa Rica and Colombia in New York, the minister from Ecuador to England, and others, besides the opening remarks of Secretary of State William J. Bryan and a statement by Secretary of Commerce William C. Redfield. Many obstacles to the development of Latin-American trade with the United States were commented on, notably the matter of credits and that of a proper understanding of the Latin-American way of doing business on the part of business men in the United States.

Wireless-Telephone Sets for Railroad.—In the *Electrical World* of May 30, 1914, was described a radiotelephone apparatus used on one of the through fast trains and at the Scranton (Pa.) station of the Delaware, Lackawanna & Western Railroad. Extensive experiments were carried on by Mr. L. B. Foley, the railroad company's superintendent of telegraph, and they proved so satisfactory that two complete sets were subsequently purchased from the De Forest Radio Telephone & Telegraph Company, 101 Park Avenue, New York. The wireless telephone put out by this company is proving popular on private yachts, houseboats and large estates. It is also well adapted for use in the Revenue Service, coast and inland surveying and river and harbor work. An inquiry from a mine owner in Mexico suggests another field for its employment. During the past few years revolutions have been recurring with periodic regularity, and with the inception of each new outbreak the first thought of the revolutionists seems to be connected with the cutting of wires. The mine owner referred to has a telephone line connecting two mines and the wires have of late been frequently cut. A wireless telephone, of course, would be an ideal substitution in such a region.

Foreign Magneto Works Tied Up on Account of War.—The plants of the Bosch Magneto Company, of London, and of the affiliated company of Paris have been operated under governmental supervision since the war began, and the products of the two plants are being utilized chiefly for war purposes. A great many of the aeroplanes and motor cars used by the armies and navies of the countries at war are operated with Bosch magnetos, and of course the magneto equipment is an important part of each vehicle. Since the war commenced the Bosch Magneto Company of New York, which has hitherto filled orders only from North America and the Philippine Islands, is shipping its products all over the world, and particularly to

England and France. The American company is receiving some raw material from Germany, chiefly from the parent concern in Stuttgart. The immediate effect of the war on the Bosch company of New York was a sudden drop in business, but this condition is now considerably alleviated and it is expected that the business for October will be fully 20 per cent greater than that for September. The company's products are supplied to dealers (including garages) and to manufacturers. The business with the latter is not so good as with the former owing to a general retrenchment.

Copper Report for 1913.—A general report on copper for 1913 was recently issued by the United States Geological Survey. Statistics are given of the mining, smelting and refining of the metal. The smelter production of copper in 1913, it is stated, showed a slight decrease from that of 1912. This decrease was due to abnormal conditions in certain districts; otherwise there would have been a substantial increase. These conditions affected especially the output of the Lake Superior district, where a strike of miners was in progress for more than five months of the year. The decrease in Alaska was due to the partial destruction of the plant of the largest producer of that district, and the decrease in Montana can be attributed in part to unusual conditions. There were no important new producers added during 1913, but there were notable increases made in the production of several companies that have recently entered the producing class. The refinery production was the largest in the history of the industry, the excess over the smelter production resulting in a material reduction in the stocks of unfinished material. There is no doubt that the cost of producing copper was considerably higher for 1913 than for the preceding year. This may be attributed to several causes, the most important of which is probably the decrease in the metal content of ore treated from an average of 1.71 per cent in 1912 to 1.67 per cent in 1913. Among other causes are increase in taxes and increase in cost of labor in certain camps due to a decrease in working hours. A compilation of the cost per pound by companies giving this item in their annual reports, the Lake mines excepted, shows an average increase of 0.65 cent per lb. The selling price of copper for 1913 averaged about 1 cent per lb. less than for 1912. It is therefore evident that the profits for the year were materially lower than for the preceding year, though there was a good profit on most of the copper produced. Both domestic consumption and export of copper showed an increase in 1913 over 1912, and the stocks of refined copper were small at the close of 1913. It is apparent, however, that during the last few years the producing capacity of the world has increased faster than the consuming capacity, and that if all mines make their greatest possible output a surplus of copper will result. The production of copper in 1913 by smelters from copper-bearing materials from the United States was 1,224,484,098 lb., valued at $189,795,035, as compared with 1,243,268,720 lb., valued at $205,139,338, in 1912, and with 1,097,232,749 lb., valued at $137,154,092, in 1911. The production for 1913 showed a decrease from the previous year of 18,784,622 lb., or about 1.5 per cent, in quantity and $15,344,303, or 7.43 per cent, in value. Twenty-four states and territories contributed to the copper production of 1913. According to smelter returns, the three leading states, Arizona, Montana, and Michigan, produced 69 per cent of the total output of 1913; the same states produced 72 per cent of the output in 1912. The eight leading states, including Utah, Nevada, Alaska, California and New Mexico, produced over 96.78 per cent of the total output in 1913.

NEW YORK METAL MARKET PRICES

	Oct. 20	Oct. 27
Copper		
Prime Lake	11.37½ to 11.62½†	11.40 to 11.60†
Electrolytic	11.20 to 11.30†	11.30 to 11.35†
Casting	11.10 to 11.20†	..... to 11.25†
Copper wire base	12.75 to 13.00	..... to 12.75
Lead	3.50	3.50
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.00	8.00
Spelter, spot	5.10 to 5.15	5.10 to 5.15
Straits tin	29.00	30.75
Aluminum, 98 to 99 per cent.	18.00 to 18.50	18.00 to 18.50

COPPER EXPORTS

Total tons to Oct. 28	22,483

†Nominal.

Corporate and Financial

Arkansas Light & Power Mortgage.—The Arkansas Light & Power Company, of Little Rock, Ark., has filed a mortgage with the Guaranty Trust Company of New York to secure a one-million-dollar issue of two-year 6 per cent gold notes. The mortgage is dated Sept. 1, 1914.

First Buying of Bonds.—What is probably the first sale of public utility bonds was made recently by the Rockland Light & Power Company, of Nyack, N. Y. The company sold $50,000 of first mortgage 5 per cent bonds to Perry, Coffin & Burr, of Boston. The bonds are part of an authorized issue of $1,000 000 due Nov. 1, 1938, and of which previous to this sale $605,000 was outstanding. The last selling price of this security was 96 and interest.

Pacific Gas & Electric to Buy Notes.—The Pacific Gas & Electric Company, of San Francisco, Cal., has asked for tenders as of Oct. 31 for $2,500,000 of its one-year 5 per cent gold notes maturing March 25, 1915, being part of an outstanding issue of $7,000,000. The committee in charge will add accrued interest to and including Oct. 31, amounting to $5 per thousand-dollar note. The committee consists of representatives of the Bankers' Trust Company, Harris, Forbes & Company and N. W. Halsey & Company.

Annual Report of Sherbrooke Railway & Power Company.—The annual report of the Sherbrooke (P. Q.) Railway & Power Company for the year ended June 30, 1914, shows gross revenue from all sources of $141,990, from which is deducted $87,970 for operation, maintenance and management, leaving $54,020 as net revenue. This is further increased to $57,237 by $3,217 as balance to credit of 1913. From this is deducted $56,080 for bond interest and other miscellaneous accounts, included in which was $3,292 for disputed taxes for three years 1911, 1912 and 1913, leaving $1,157 as a balance carried to profit and loss. In submitting the report to the stockholders at the annual meeting, Sept. 28, 1914, Mr. C. J. McCuaig, president of the company, made the following statement: "The industrial depression which affected the whole of the Dominion of Canada during the past eighteen months affected both the street-railway earnings and the energy revenue, as several manufacturers reduced their motor-service requirements. The prospects, however, for increased earnings in 1915 are as favorable as can be expected, although they must be necessarily affected to some extent by the European war. During the past year the company acquired the assets and undertakings of the Burroughs Falls Power Company, Ltd., at Ayers Cliff, P. Q., which adds another electric-lighting system to those already owned, and a further interest was acquired in the Lennoxville Light & Power Company, which controls the lighting and power business of Lennoxville and Huntingdon. The acquisition of these companies should still further increase the revenue of the company. During the existing financial conditions in the past year your directors were unable to sell sufficient securities to cover the entire cost of these extensions and purchases, and advances were obtained from the company's bankers to cover the balance required."

Boston Edison Report.—In discussing the year's work of the Edison Electric Illuminating Company of Boston, Mass., President C. L. Edgar pointed out that the gross earnings have increased almost exactly 10 per cent, and as the kilowatt-hours manufactured correspond closely with this, the average price has not changed. The connected load has increased 3 per cent faster than the energy sold and the gross earnings, probably on account of the increasing use of tungsten lamps. The expenses for the year were unusually high, chiefly on account of the partial use of the general service buildings and resulting separation of clerical, stenographic and filing forces. The savings resulting from the opening of this great property, which was described in the *Electrical World* of July 11, 1914, are reflected in the lower cost of freight, teaming, handling and in the ability to buy in larger quantities. These savings affect the construction accounts more than the operating accounts, so that for the future the expenses will be higher than if the property had not been put into service, but the construction accounts will be lowered by an amount much in excess of the increase in expenses. Mr. Edgar said that no additions or improvements which the company has

made in the past dozen years have had so satisfactory an effect, looked at from either the physical, financial or organization standpoint. For the present the company is financing extensions by notes. The connected load increased 13 per cent during the year, and in the past four years the incandescent lamp load (50-watt equivalents) has increased from 1,432,407 to 2,245,547, arc lamps from 10,919 to 12,297, motors from 57,094 hp to 106,205 hp, and the total load in 50-watt equivalents from 2,408,926 to 3,973,881.

Atlantic Gas & Electric Status.—In a circular to the stockholders of the Atlantic Gas & Electric Company, for which a receiver was appointed recently, Mr. Thomas C. Perkins, of Hartford, Conn., who was instrumental in distributing the common and preferred stock of the company, said: "A majority of the board has found it expedient to put the company temporarily into the hands of a friendly receiver. The firm of Meikleham & Dinsmore were the bankers for the company, being under agreement to pay cash for such stock, bonds and other securities as the company might issue from time to time to provide for the development and extensions of the various subsidiary companies. These securities were in turn either sold to other brokers like ourselves, who, after carefully investigating the matter, purchased a large block of preferred and common stock of the Atlantic company, or were placed through Meikleham & Dinsmore's own organization. It now transpires that Meikleham & Dinsmore had during the last year borrowed from their bank connections in New York and elsewhere, on their own notes, about $1,000,000 as temporary loans, secured by the securities which they had bought and paid for as aforesaid, expecting to sell the same later on to investors. It further transpires that, owing to the tightening of the money market, some of the large banks holding much of this firm's paper called a meeting of those holding these notes, which resulted late in July in a committee being formed representing these banks. This committee stopped Meikleham & Dinsmore from selling securities or negotiating other loans for the Atlantic company, thus leaving that company without any bankers in a time of most severe complications in the financial world. No one can criticise Meikleham & Dinsmore as to their good faith in this matter, they having invested almost their entire capital in the company, as well as having borrowed to their credit over $1,000,000 to carry out their obligations to it. A large amount of money had been provided—considerably over $1,000,000—for the building of a large modern power plant at Easton, Pa., also another power plant at Boonton, N. J., and transmission lines and other developments, which greatly increased the efficiency of the subsidiary companies in New Jersey and Pennsylvania. Most of the work was finished and paid for, but the Atlantic company was left in the position where, in order to complete certain construction work, it had to assume obligations to pay $300,000 or $400,000, which it naturally expected to obtain through Meikleham & Dinsmore. With a view to preparing the way for the obtaining of new banking connections for the enterprise, I had the Atlantic company retain the services of Stone & Webster, of Boston, to make an investigation and audit of the affairs of the company and all its subsidiaries so we should have an absolutely independent showing of the exact condition of the Atlantic company, how much money was needed, what its earnings were and what its future would be. This report substantiated what we always understood of the affairs of the Atlantic company as to its present and future earnings. The extraordinary financial conditions brought about by the European war situation have so far made it impossible to liquidate the claims against the Atlantic company, although the last statement submitted to me by the treasurer, covering the twelve months ended Aug. 31, showed net earnings in excess of preferred dividend requirements. Plans are in process for straightening out the affairs of Meikleham & Dinsmore and to put the Atlantic company on a sound basis, but in the meantime some of the smaller creditors have made a receivership necessary. I expect to organize an independent shareholders' committee, consisting of myself and associates, whose clients are interested in this stock, and to ask deposits of the preferred and common shares, thus placing us in a position not only to assist toward helping straighten out this situation but to protect the interests of our clients and the stockholders to the greatest extent possible."

SHOWING OF NEW ENGLAND UTILITIES

Comparative Returns for August Indicate Gains Over the Same Month a Year Ago

Although many of the industries of the New England States are at a standstill, the central stations still showed a gain in August, 1914, over the same month in the preceding year. The decline of the foreign trade due to the war shut off one of the large avenues for the marketing of New England's products, and the effects of such conditions are readily seen in Tables I and II. While the income per-

TABLE I—COMPARATIVE RETURNS FOR MAY, JUNE, JULY AND AUGUST 1913 AND 1914, COVERING 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE NEW ENGLAND STATES

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	$1,704,102	$1,573,119	8.4	51,519,410	49,752,133	3.6
June	1,467,791	1,356,552	8.3	50,456,031	45,268,312	11.6
July	1,551,797	1,419,597	9.3	50,644,731	45,861,737	10.4
August	1,708,730	1,589,213	7.5	52,398,832	49,576,095	5.5

centage increases do not seem to have been vitally affected, the percentage figures for output growth tell a different story. Out of the twenty-six companies reporting to the *Electrical World* from New England, nine registered output decreases in comparison with 1913; four showed income decreases as well, and two showed income decreases alone. To be sure, a couple of these companies were showing a decrease before the war started.

The returns have as far as possible been segregated by states. Where a holding company sent in gross figures for New England the figures were used only in Tables I and II and not in the figures by states. This resulted in there

TABLE II—RETURNS FOR APRIL, MAY, JUNE, JULY AND AUGUST FOR ALL NEW ENGLAND COMPANIES REPORTING TO ELECTRICAL WORLD

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April (52 per cent of industry)	$1,501,773	$1,384,225	8.5	43,386,624	39,181,988	10.8
May (63 per cent of industry)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June (67 per cent of industry)	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1
July (70 per cent of industry)	1,670,819	1,530,410	9.2	54,074,533	49,255,893	9.8
August (71 per cent of industry)	1,834,583	1,707,649	7.5	55,801,224	52,913,483	5.4

being but one company reporting from Vermont, and consequently the figures for that State are not here given. Ten companies, mostly large companies, reported from Massachusetts. Their total income for August, 1914, was $814,490 and for the previous August $746,658. This was a 9 per cent increase. The output grew 3.8 per cent, from 23,410,625 kw-hr. to 24,344,104 kw-hr. Two companies reported from Rhode Island. They serve, however, most of the State. Their income increased 15.4 per cent, from $133,230 to $153,756, and their output increased 18.5 per cent, from 3,843,552 kw-hr. to 4,556,740 kw-hr. Three companies in Connecticut reported a 5 per cent income growth, from $103,063 to $108,345. The growth in output was 3.7

per cent, from 3,750,610 kw-hr. to 3,891,809 kw-hr. Three Maine companies reported for last August a total income of $232,795 as against $238,744 this August, or a 2.25 per cent gain, and the total output increased from 5,489,947 kw-hr. to 5,672,061 kw-hr., or 3.4 per cent. From New Hampshire three companies reported a total income of $63,033 as compared with $60,943 in the previous year, or a 3.5 per cent increase. The increase in output was 6.6 per cent, from 2,066,187 kw-hr. to 2,204,597 kw-hr.

The same companies which formed the compilation for the states have been grouped according to the population they serve. The first group contains five companies in cities of over 100,000 inhabitants. The total income for these companies in August, 1914, was $750,559 and in the previous year was $679,666, a 10.5 per cent growth. The output grew 5.1 per cent, from 21,470,393 kw-hr. to 22,559,816 kw-hr. The second group was made up of seven companies in cities having between 50,000 and 100,000 inhabitants. Their total income increased 4.8 per cent, from $439,726 to $461,178, and their total output grew 15 per cent, from 11,686,154 kw-hr. to 12,837,833 kw-hr. The third group contained four companies operating in towns whose population is between 25,000 and 50,000 inhabitants. While two of the companies showed slight gains in income, the other two showed sufficient decreases to make a total decrease of 0.6 per cent, from $66,748 to $66,384. Three of the companies showed decreases in output, making a total decrease of 7.1 per cent, from 1,738,711 kw-hr. to 1,612,349 kw-hr. The fourth group contained six companies operating in towns of less than 25,000 population. The total income increased 10 per cent, from $98,263 to $107,948. The total output increased but 2 per cent, from 4,488,098 kw-hr. to 4,580,044 kw-hr.

Cities with from 50,000 to 100,000 population seem to be little if at all affected by the war. In fact, a review of returns for July shows the August figures to be better. The hardest blow seems to have been to those companies in towns of between 25,000 and 50,000 inhabitants. This was owing to the fact that the towns of this group, with one exception, were purely manufacturing towns. The one exception was the only one to register an increase. That town has practically no manufacturing. The companies in the last group show practically the same state of affairs as did the companies in the largest cities.

Trade Publications

Steel Chains.—The Link-Belt Company, Chicago, is distributing Booklet No. 124, entitled "Steel Chains."

Flexible Armored Conductors.—Realflex steel-armored conductor is referred to in a folder issued by the Western Conduit Company, Youngstown, Ohio.

Switch Boxes.—Prices of Union switch boxes are given in a leaflet which is being distributed by the Mohawk Electrical Supply Company, Syracuse, N. Y.

Belt-Driven Alternators.—A description of the construction of belt-driven alternating-current generators made by the General Electric Company is given in Bulletin No. 40,400.

Springs and Screw-Machine Products.—Booklet No. 6 prepared by the Wallace Barnes Company, Bristol, Conn., contains information regarding springs and screw-machine products.

Lamp-Dimming Device.—A lamp-socket device containing resistance for dimming the lamp is described in a pamphlet which is being sent out by the Wirt Company, Philadelphia, Pa.

Oil and Gas Engines.—Answers to questions regarding oil and gas engines are given in special Bulletin No. 207 issued by the Chicago Pneumatic Tool Company, Fisher Building, Chicago.

Washer and Wringer.—The Horton Manufacturing Company, Fort Wayne, Ind., refers to its electric washer and wringer in two folders issued recently, one entitled "What They Said at the Bridge Party" and the other "Co-operation—That's Us."

Train Operation.—Circular No. 1546 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., shows some of the advantages of employing multiple-unit trains.

Heavy Traffic Centers.—Special publication No. 1549 of the Westinghouse Electric & Manufacturing Company contains illustrations of operating conditions in many of the large traffic centers in this country.

Railway Motors.—Special Publication No. 1552 of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., illustrates some railway equipments from installations in various parts of the country.

Intercommunicating Telephones.—The Menominee Electric Manufacturing Company, Menominee, Mich., has just issued Catalog No. 25 describing its line of intercommunicating telephones and apartment-house equipments.

Glass Reflector Bowls.—An illustrated price list of glass reflector bowls made by the Phoenix Glass Company, 15 Murray Street, New York City, is contained in Catalog No. 28. Catalog No. 27 contains a price list of various designs of green-plated reflectors.

Railway Exchange Data.—Considerable information of value to persons connected with the operation of electric railways is given in the "Westinghouse Railway Data Exchange" No. 10, issued by the Westinghouse Electric & Manufacturing Company.

Motors.—The Menominee Electric Manufacturing Company, Menominee, Mich., has issued a motor bulletin describing its complete line of single-phase, multi-phase, direct-current and universal motors with ratings up to and including 1 hp.

Business Notes

I. Libson Company.—I. Libson, formerly with the Sunlight Reflector Company, of Brooklyn, N. Y., is president and treasurer of the I. Libson Company, 214 State Street, Brooklyn, manufacturer of reflectors.

The Fafnir Bearing Company, New Britain, Conn., has terminated its selling arrangements with the Rhineland Machine Works Company, of New York, and will market its product direct from the New Britain office. D. D. Davis, formerly with the Rhineland company, will be in charge of the new sales organization.

The Hammond Electric Bank Protection Company, Los Angeles, Cal., has recently been formed and will manufacture electrical devices for installation in vaults of banks to give warning of robbers. W. D. Hammond is president and general manager and F. C. Mason is consulting engineer. Both Mr. Hammond and Mr. Mason have been for the past nine years active in the bank-protection field.

New Industrial Companies

The Reflecto Electric Sign Company, of Dallas, Tex., has been chartered with a capital stock of $10,000 by E. C. Jeffress, Ira F. De Loachs and T. W. Erwin.

The Modern Electric & Machine Company, of Indianapolis, Ind., has been incorporated by Louis H. Knue, H. W. Ransdall and Theodore A. Meyer. The company is capitalized at $5,000 and purposes to manufacture and deal in electrical devices.

The Garfield Electrical Company, of Chicago, Ill., has been incorporated by M. J. Kennedy, H. B. Courchens and William J. Maher. The company is capitalized at $1 000 and purposes to manufacture and deal in electrical equipment and devices.

The Vapoform Sales Company, of Paterson, N. J., has been incorporated with a capital stock of $50,000 to deal in vapoform products, electric sterilizers, etc. The incorporators are H. H. Brown, G. B. Jackson, A. T. Bennett and W. H. Plog, of Paterson, N. J.

The Model Manufacturing & Electric Company, of Wheeling, W. Va., has been incorporated with a capital stock of $25,000 to manufacture electrical appliances. The incorporators are Clarence C. Adams, of Bridgeport, Ohio; David Pittsley, James R. Affolter and John C. McAllister, of Wheeling, W. Va.

Personal Mention

Mr. F. W. Moneur has resigned as sales manager of the Canadian Tungsten Lamp Company, Ltd., Hamilton, Ont.

Mr. George W. Walters, for the last five years superintendent of distribution for the Pacific Power & Light Company in Astoria, Ore., has resigned.

Mr. M. B. Knapp, formerly of the Republic Railway & Light Company, has been appointed superintendent of the Hocking Power Company at Nelsonville, Ohio.

Mr. E. M. Baldwin, of the Baldwin & Stewart Electric Company, Hartford, Conn., has been elected president of the Electrical Contractors' Association of Connecticut, which was recently organized.

Mr. Henry H. Lyons, of the Cataract Power & Conduit Company, Buffalo, N. Y., has been elected president of the Buffalo Section of the National Electric Light Association as successor to Mr. Paulding F. Sellars.

Mr. H. S. Green has resigned as general manager of the Rock River Light & Power Company, of Sterling, Ill. The company's new plant near Sterling has been leased by the Illinois Northern Utilities Company for a long term of years.

Mr. Raymond A. Lander, formerly connected with the industrial engineering department of the Rochester (N. Y.) Railway & Light Company, has become identified with the Saginaw (Mich.) Power Company as new-business promoter.

Mr. W. P. Lewis, for some months electrical engineer in Albuquerque, N. M., has accepted the offer of assistant superintendent on the hydroelectric installation being made on the Mohawk River by the Cohoes Company, of Cohoes, N. Y.

Mr. F. A. Nash, who has been for many years active in the direction of the work of the Omaha Electric Light & Power Company, Omaha, Neb., has retired from the position of president of the company and has been appointed chairman of the board of directors.

Mr. A. M. Summer, who recently resigned as assistant superintendent of the Rockingham County, Light & Power Company, of Portsmouth, N. H., was presented with a gold watch fob bearing the Masonic emblem by the employees of the company, as token of their appreciation and esteem.

Mr. Fred R. Jenkins, manager of the Chicago Central Station Institute, has been appointed chairman of the committee on the education of salesmen of the Commercial Section, National Electric Light Association, vice Mr. F. C. Henderschott, of the New York Edison Company, who had been named for the position but was unable to serve.

Mr. Hammond Mathews, who has been chief electrician of the Arizona Copper Company, of Clifton, Ariz., has resigned to accept a position with the Arizona Power Company at Prescott, Ariz. Mr. Mathews has been connected with the Arizona Copper Company about four years, and prior to that time was connected with the San Juan Water & Power Company, of Durango, Colo.

Mr. W. C. Rowse, who has been experimental engineer for the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just been appointed professor of mechanical engineering at the University of Manitoba, Winnipeg, Canada. The provincial government has set aside a large tract and appropriation for the new engineering buildings of the university, which will be built shortly.

Gen. George H. Harries, president of the Louisville (Ky.) Gas & Electric Company, has been elected president of the Omaha (Neb.) Electric Light & Power Company. General Harries will devote part of his time to the Omaha property, although maintaining his home at Louisville, where he will continue in charge of the local gas and electric properties for H. M. Byllesby & Company.

Mr. C. W. Kellogg, Jr., has been appointed manager of the Mississippi River Power Company, Keokuk, Ia., for the Stone & Webster Management Association. Mr. Kellogg was formerly manager of the El Paso (Tex.) Electric Company, the El Paso Electric Railway Company, the El Paso & Juarez (Mexico) Traction Company, the Beaumont (Tex.) Electric Light & Power Company, and the Port Arthur (Tex.) Light & Power Company for the same interests.

Mr. W. P. Southard, manager of the Las Vegas (N. M.) Light & Power Company, has been unanimously re-elected president of the Commercial Club of that city. Mr. Southard is considered one of the most able of the Federal Light & Traction Company managers, and it is the public policy of the Federal company to urge its representatives to take interest in public affairs in the cities in which it operates.

Mr. David F. Atkins has been appointed acting chief engineer of light and power of the department of water supply, gas and electricity, New York City, by Mr. William Williams, the new commissioner. Mr. Atkins is a native of Massachusetts and came to New York eight years ago. Prior to his present appointment, he was division engineer of lighting of the department. He succeeds Mr. Charles F. Lacombe.

Mr. J. Harry Pieper, who was on Oct. 21 elected statesman of the Southern California Jovian Electrical League, has been with the Southern California Edison Company since September, 1909. He was previously identified with the electric-sign industry for some years in Boston and New York, and went to Los Angeles to promote electric-sign development for the Edison company. Two years ago last January, in addition to his sign work, he took up for the company the promotion of electric-vehicle business. Mr. Pieper is still in charge of the Edison company's vehicle and sign promotion activities, with the title of assistant to the general agent, received in December, 1913. He has been a Jovian for two years, having been a director for the year 1913-1914 and chairman of the program committee. Surprises sprung on Mr. Pieper by members on Oct. 21 included the presentation of a birthday cake and, after an earnest speech of congratulation on the good results for the league derived from his activities during the past year, a toy automobile with 10-in. wheelbase. This jest was followed up by his "real friends, not on the committee," with the presentation of a handsome scarfpin from the league.

J. HARRY PIEPER

Mr. W. W. Freeman has been elected president of the Union Light, Heat & Power Company, of Cincinnati, and the South Covington & Cincinnati Street Railway Company, subsidiaries of the Columbia Gas & Electric Company, vice Mr. James E. Ernst, resigned. Mr. Freeman prior to going to Cincinanti was connected with the Alabama Power Company at Birmingham, Ala., and prior to that was for many years vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn. He is a past-president of the National Electric Light Association and of the Association of Edison Illuminating Companies and is one of the best-known executives in the central-station field. His career has been rather remarkable and is indicative of the possibilities open to men of initiative and enterprise. Born in Exeter, Ontario, on June 8, 1872, Mr. Freeman took up work in the lighting industry as a stenographer with the Brooklyn Edison company, advancing step by step to be vice-president and general manager. News of his resignation from the Brooklyn Edison company was received with regret by the employees of that organization, and the way in which those employees still idolize Mr. Freeman is a striking tribute to the personal character and magnetism of the man.

W. W. FREEMAN

Construction

New England

MILLINOCKET, MAINE.—Plans for the erection of a paper and pulp mill at Mattaceunk, on the Penobscot River, are reported to be under consideration by Charles W. Mullen, of Bangor. The plans, it is understood, include a large water-power development at Mettaceunk. The Mattawamkeag & Northern R. R. Co. has filed a petition with the State Board of Railroad Commissioners asking for approval of a 6-mile portion of a proposed railroad (to be operated by electricity) through Mattawamkeag to Millinocket. Mr. Mullen is president of the railroad company.

VINAL HAVEN, MAINE. — Contracts have been awarded by the Vinal Haven El. Pwr. Co., recently organized, for the installation of a steam-driven electric generating plant in Vinal Haven. Messrs. Haven & Crosby, of Boston, Mass., are engineers. F. S. Walls, of Boston, Mass., is president, and A. S. Littlefield, of Rockland, attorney.

GLOUCESTER, MASS.—Within the next six months the Gloucester El. Co. expects to purchase one 750-kw engine-driven alternator, one 50-kw exciter set, with necessary condensing apparatus and switchboard appliances. E. L. Munger is superintendent.

Middle Atlantic

ITHACA, N. Y.—Bids will be received by E. L. Williams, treasurer of Cornell University, Ithaca, until Nov. 5 for poultry-plant extension, including laying and brooding houses, exhibition building, fattening and feed houses, construction, heating, plumbing and electric work, at the New York State Agricultural College, Cornell University, Ithaca. Drawings and specifications may be consulted at the New York office of the Department of Architecture, 1224 Woolworth Building, New York, N. Y., at the office of the treasurer, Cornell Uniersity, and at the office of the Department of Architecture, Capitol, Albany. Lewis F. Pilcher is state architect.

LOCKPORT, N. Y.—Bids will be received by the Board of Education, city of Lockport, Union School Building, Lockport, until Nov. 17 for enlargement and improvement of the Union School Building, including masonry, carpentry, plumbing, electrical work, heating and ventilating, separate bids to be submittted for each department. Proposals for the entire work, separately itemized, may be submitted. Plans and specifications may be seen at the office of the Board of Education and at the office of William Neil Smith, architect, 101 Park Avenue, New York, N. Y.

WEEDSPORT, N. Y.—At an election held Oct. 15 the proposal to issue $18,000 in bonds for a municipal electric-light plant was carried.

HANOVER, PA.—Bids, it is reported, will be received by Frank C. Rowe, secretary Hanover Township, until Nov. 5, for lighting the streets and public places of Hanover. The plans provide for not less than 150 7½-amp inclosed-arc lamps.

PHILADELPHIA, PA.—The contract for construction of new power house for the A. Schoenhut Co., Boston Avenue and York Street, Philadelphia, has been awarded to F. A. Havens & Co.

PITTSBURGH, PA.—The Board of Public Education has engaged Harold Kirschberg, Century Building, Pittsburgh, illuminating engineer, to make tests to decide upon the illuminating system for schoolhouses.

LINDEN, N. J.—Steps have been taken by the Borough Council for lighting the streets of Linden.

VENTNOR CITY, N. J.—Bids will be received by the Common Council of Ventnor City until Nov. 16 for furnishing and installing apparatus for a complete fire-alarm and police-telegraph system with flash-lights. Bids will also be received at the same time and place for furnishing and installing all ducts, cables, etc., for above system. For details see proposal columns.

DENTON, MD.—A permit has been granted to the Peninsula Lt. & Pwr. Co. to erect a power plant in Denton. T. P. Fisher is general manager.

FREDERICK, MD.—Plans, it is reported, are under way for the construction of a power plant at the old Weverton dam on the Potomac River. The proposed plant will have an output of 15,000 hp minimum and 25,000 hp maximum, and will supply electricity, it is said, for lighting the streets and operating the street railway system in Washington.

RICHMOND, VA.—The Administrative Board has instructed E. W. Trafford, manager of the municipal electric-light plant, to prepare plans and estimates of cost of extending the lighting system in Oak Grove, Swansboro, Woodland Heights, Forest Hill and Forest Hill Annex, suburbs of the city.

WASHINGTON, D. C.—A dealer in electrical supplies, mirrors and cut glass advises an American consular officer that he desires to buy from American manufacturers. Correspondence may be in English. For further information address No. 14,077, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—Bids will be received by the Secretary of the Interior, Department of the Interior, Washington, D. C., until Nov. 21 for furnishing material and labor, unless otherwise specified, required in rewiring the first floor and basement of the Patent Office Building, Washington, D. C., in accordance with specifications copies of which may be obtained on application to the chief clerk of the department.

WASHINGTON, D. C.—An American consular officer in Southern Europe reports that a dealer in electric lamps, wire, bells, alarms, mantles of all kinds and other electrical supplies desires to receive catalogs from American manufacturers. Correspondence and catalogs should be in French or Spanish. For further information address No. 14,082, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—An American consular officer in a southern European country advises that the chief of the government supply department of posts and telegraphs wishes to secure as soon as possible catalogs and price lists of telegraph, telephone and post office equipment and supplies. Catalogs, etc., should also be sent to the consular officer. For further information address No. 14,051, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—An American consul in Great Britain advises that a firm in his district is open to purchase, immediately after testing samples, arc-lamp carbons for bioscope and stage arc lamps. This firm is also interested in heat-resisting insulators of its own design. Samples are desired of water-tight screw holders for electric-sign work. Further information may be obtained by addressing No. 14,158, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 17 to be delivered at the various navy yards and naval stations as follows: Annapolis, Md., Schedule 7478—miscellaneous lead-sheathed, rubber-insulated conductor. Newport, R. I., Schedule 7480—10,000 lb. calcium phosphide, 3000 lb. alloy sheet aluminum (36 mils to 42 mils), 500 lb. aluminum solder in sticks. Norfolk, Va., Schedule 7486—miscellaneous composition stop-check valves; Schedule 7493—6200 lb. round, hard-drawn bar copper, in commercial lengths. Brooklyn, N. Y., Schedule 7478—5000 ft. single, rubber-insulated lighting and power wire. Washington, D. C., Schedule 7489—miscellaneous commercial brass plates. Charleston, S. C., Schedule 7493—8000 lb. hard sheet copper, 1150 lb. soft sheet brass. Bids will also be received at the same place until Nov. 24 as follows: Norfolk, Va., Schedule 7503—900 sal-ammoniac cylinders (1.85 in. outside diameter), miscellaneous cork disks from first-class solid slabs, 3240 soft-rubber gaskets; Schedule 7502—58,711 lb. galvanized-steel wire rope (3/16 in. in diameter, six strands, 24 wires each), 492 lb. bronze phosphor wire; Schedule 7501—miscellaneous drawn seamless brass tubing, 2305 lb. black steel tubing, miscellaneous rolled naval brass angles and bars, 2698 lb. rolled naval brass plates, 4698 lb. rolled naval brass disks. Washington, D. C., Schedule 7496—one double-acting, triplex vertical pump; Schedule 7499—50 250-watt, 25-volt, direct-current dynamotors and spare parts, to be delivered at Boston, Brooklyn, Charleston and Norfolk. Bids will also be received until Dec. 1, as follows: Mare Island, Cal., Schedule 7473—one 1000-sq. ft. surface condenser, one 350-sq. ft. surface condenser, with air and circulating pump and accessories; Schedule 7474—three water system centrifugal pumps complete. Applications for proposals should designate the schedule desired by number.

North Central

MONTGOMERY, MICH. — Preparations are being made by M. E. Maze to install an electric-light plant to furnish electricity for lighting the streets of the village and for commercial purposes. Equipment for the proposed plant, it is understood, has been purchased.

SAGINAW, MICH.—At the election to be held Nov. 3 the proposal to establish a municipal electric-light plant will be submitted to the voters. Two propositions will be submitted, one to issue $750,000 in bonds to install a power plant and distributing system; the other to issue bonds to the amount of $540,000 for a distributing system only.

HAMDEN, OHIO.—Following a notice given by the Hocking Valley Ry. Co. that it will not furnish energy to the village after Jan. 1, 1915, a movement has been started to organize a company to be known as the Hamden Lt. & Garage Co., to be capitalized at from $10,000 to $15,000, to furnish electricity in Hamden.

KENMORE, OHIO.—Acting upon the recommendation of H. Whitford Jones, of Cleveland, consulting engineer, the City Council has decided to abandon its plans for the installation of a municipal electric-light plant and has authorized Mr. Jones to enter into negotiations with the Northern Ohio Trac & Lt. Co., of Akron, to supply electricity for street lighting and to operate the water-pumping and sewage-disposal plants on Brodt Avenue, and with the new Barberton power plant to furnish energy for the stations on Kentucky Avenue. The plans provide for 42 new nitrogen lamps of 250 cp to be erected along the Kenmore Boulevard. In other parts of the city 80-cp nitrogen lamps will be used.

URBANA, OHIO.—The City Council has granted the Urbana Lt. Co. permission to lay conduits under the sidewalks, to carry wires for the proposed new street-lighting system. Contracts, it is understood, have not yet been placed for standards or lamps for the new system.

CLAY, KY.—The Clay Lt. & Ice Co. expects to erect within the next two months about 4 miles of transmission lines for suburban districts and to install 10 additional street lamps; also to purchase a 150-hp engine, either automatic or Corliss (second hand), one 50-kw, single-phase, 60-cycle, 2200-volt generator with exciter and switchboard, Wood system, Fort Wayne (second-hand equipment preferred). C. R. Clark is secretary.

NEW HAVEN, KY.—At the election to be held Nov. 3 the proposal to issue $4,500 for the installation of a municipal electric-light plant will be submitted to the voters.

BROWNSTOWN, IND.—The Brownstown Wtr. & Lt. Co. is now extending its transmission lines to the towns of Medora and Vellonia and will purchase material for about 10 miles of pole line. The Brownstown company is owned and controlled by the Indianapolis Engineering Co., 328 American Central Life Building, Indianapolis

FORT WAYNE, IND.—Bids will be received by the Board of Public Works of the city of Fort Wayne, City Hall, Fort Wayne, until Nov. 10, for furnishing to the municipal electric light and power plant during 1915 various types and sizes of incandescent lamps. The minimum amount to be purchased is $2,500 and the maximum amount $5,000.

RICHMOND, IND.—A petition has been presented to the City Council for the installation of an ornamental street-lighting system on Main Street from Third Street to Twelfth Street, and on the principal section of Fort Wayne Avenue and North East Street.

DIXON, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, until Nov. 23, for the erection of three buildings on the site of the State Colony for Epileptics, near Dixon, as follows: (1) Administration building, (2) dining-room and kitchen and one dormitory. Separate bids will be received for general work, heating, electric wiring and plumbing. Plans and specifications may be obtained upon application to James B. Dibelka, state architect, 29 South LaSalle Street, Chicago.

EDWARDSVILLE, ILL.—Bids will be received by Harry Mackinaw, county clerk, Edwardsville, until Nov. 6 for furnishing and installing two electric passenger elevators in the Madison county court house. Bids will also be received at the same time and place for the installation of a mail-chute equipment. Drawings and specifications may be obtained at the office of Robert G. Kirsch, architect, Magnolia Avenue and Thurman Street, St. Louis, Mo.

HAVANA, ILL.—The City Council has awarded the contract for lighting the streets of the city to the Central Illinois Pub. Ser. Co. for a period of one year. Under the

terms of the contract the company is to replace the six arc lamps in the business district with fifty ornamental standards carrying five-lamp clusters.

NOKOMIS, ILL.—At a special election held recently the proposal to issue $25,000 in bonds to establish a municipal electric-light plant in Nokomis was carried.

WAUKEGAN, ILL.—The contract for installing the ornamental street-lighting system on Washington and Genesee Streets has been awarded to A. G. Gement, of Racine, Wis.

ALPHA, MINN.—The Council has granted L. T. Sterling a franchise to construct and operate an electric-lighting system in Alpha. Work, it is understood, will begin at once on the installation of the plant.

ST. PAUL, MINN.—A permit has been granted the diocese of St. Paul to erect a one-story power house on Selby Street, near Summit Street, to cost about $15,000. William J. Hoy & Co. are contractors.

SLAYTON, MINN.—The village of Slayton has granted F. H. Eddy a franchise to furnish electricity here; also a contract for street-lighting and for pumping the water supply. Work will begin at once on the erection of power house and distribution system. Arrangements have already been made for equipment of proposed plant.

BOONE, IA.—The Fort Dodge, Des Moines & Southern R. R. Co., of Boone, is contemplating improvements and extensions to its plant at Fraser, to cost about $50,000.

CHARLES CITY, IA.—The Cedar Valley Pwr. Co., of Charles City, has purchased the two electrical properties in Charles City, as well as the property of the Parkersburg El. Lt., Ht. & Pwr. Co., of Parkersburg, and is now negotiating with several other companies for their properties. Franchises have been secured by the company in the towns of Allison and Dumont, and the company has also signed a contract to furnish energy to the municipal electric plants in Aplington and Austinville. Within the next 15 months the company expects to erect 60 miles of 33,000-volt transmission line, 10 substations and three distribution systems; also to purchase one 300-hp boiler (150 lb. pressure), one 300-kw, three-phase, 60-cycle, 2300-volt generator and switchboard panel, one 400-hp engine for use with above generator, two 100-kw, three-phase, 60-cycle, 2300-volt generators with switchboards, one 75-kw, three-phase, 60-cycle, 2300-volt generator and engine (directly connected) with switchboard, one 50-kw three-phase, 60-cycle, 2300-volt generator and oil engine (directly connected) with switchboard, one 50-kw, 60-cycle, 2300/6600-volt transformer, one 37½-kw, 60-cycle, 6600/2300-volt transformer, 140 5-amp, 20 10-amp, 10 15-amp, 5 20-amp, 2 25-amp and 1 50-amp meters, all 60 cycles, single-phase, 110 volts. H. H. Dodd is purchasing agent.

DENISON, IA.—Within the next two months the city of Denison expects to install a new electric generating plant with an output of 300 kw, contract for which has been awarded to the McGraw Co., of Omaha, Neb. The city has recently installed an ornamental street-lighting system, consisting of 65 standards carrying five-lamp clusters. J. B. Hill, of Iowa City, is consulting engineer. H. G. Miller is acting superintendent.

DES MOINES, IA.—Within the next three months the Des Moines El. Co. expects to complete the extension to its power station, together with a 209-ft. steel stack, two boilers, 4000-kw turbo-generator, condenser, switchboard equipment, etc., costing approximately $100,000. The company expects to purchase within the next three months the usual amount of line construction material and electrical appliances and household devices. W. H. Thomson, Jr., is general manager.

DOW CITY, IA.—The Electric Light Commission expects to purchase within the next two months one 25-hp or 50-hp oil engine, a 17½-kw or 30-kw generator and a switchboard panel. A. E. Loring is engineer.

ESTHERVILLE, IA.—The Electric Light Commissioners expect to install a 225-hp Diesel engine and a 250-kva generator within the next two months. Equipment already purchased and also material for 10 miles of new line. N. B. Egbert is city clerk.

MOUNT PLEASANT, IA.—The City Council has decided to erect 30 six-lamp electroliers around the square and court house. For further information address R. S. Galer, president of the Commercial Club.

POCAHONTAS, IA.—The Electric Light Commissioners expect to erect a 100-kva outdoor substation and ¾ mile of two-phase transmission line connecting the municipal electric plant with the line of the Northern Iowa Pwr. Co. within the next two months, or to purchase a 100-hp oil engine and generator; also to purchase two 50-kva, 23,000-volt, three-phase, 60-cycle transformers, switches, etc. O. B. Cade is manager.

SEYMOUR, IA.—Within the next three months the city of Seymour expects to purchase 200 25-ft. (5-in.-top) poles and 35,000 ft. No. 8 bare wire for the municipal electric-lighting system. Milo Neely is superintendent.

CABOOL, MO.—The Bauch Mill & Elevator Co., it is reported, contemplates the installation of an electric-lighting plant and ice factory in connection with its flour mill. A. R. Beckett is interested.

TROY, MO.—Within the next 30 days the town of Troy expects to purchase a boiler for the municipal electric-light plant. D. A. Presley is superintendent.

OAKES, N. D.—The Oakes Lt. & Pwr. Co., it is reported, is contemplating extensions to its power plant and lighting system.

FLANDREAU, S. D.—Bids will be received by George A. Chorpening, county auditor, Flandreau, until Nov. 18, for metal furniture, electric-light fixtures and decorating the Moody County court house at Flandreau. Plans are on file at the office of the county auditor and at the office of Joseph Schwartz, architect, Sioux Falls.

MORRILL, NEB.—Plans are being considered for the installation of a municipal electric-light plant in Merrill, in connection with the water-works system, to cost about $4,500. Contracts for the work will probably be awarded in about 30 days.

CENTRALIA, KAN.—Within the next two months the city of Centralia expects to erect a transmission line from Corning; also to purchase one boiler (60 in. by 16 ft.), 150 lb. working pressure, one 50-kw, three-phase alternating-current generating unit (directly connected), switchboard extension, regulator, etc. D. A. Steiner is superintendent.

Southern States

ACWORTH, GA.—Within the next three months the Water and Light Commission expects to purchase a pump and electric motor. William G. Grogan is chairman of water and light commission.

GRIFFIN, GA.—The Light, Water and Sewage Commission expects to purchase within the next two months fifty 30-ft. and 35-ft. poles, five 2300-volt, single-phase lightning-arrester sets, 500 top-groove porcelain insulators and 1700 lb. weather-proof wire. G. J. Drake is superintendent.

HOMESTEAD, FLA.—Preparations are being made by the Homestead Lt., Ice & Pwr. Co., it is reported, for the installation of an electric plant and ice factory, to cost from $12,000 to $16,000. J. U. Free is manager.

PULASKI, TENN.—The City Council has decided to install a new 200-hp steam-power plant and would like to receive estimates and prices on equipment for same, including Corliss engines, generators and boilers. A new power house is now under construction. For further information address H. F. Wheeler, Mayor.

GAYLESVILLE, ALA.—The installation of a municipal electric-lighting plant is reported to be under consideration by the City Council.

IBERVILLE, LA.—Bids will be received by J. J. Powell, president of the board of control, Louisiana Lepers' Home, 128 New Court House Building, New Orleans, until Nov. 10 for construction of an electric-light plant. The equipment will include a 25-kw generator.

MELVILLE, LA.—All bids submitted for construction of municipal electric-light plant have been rejected by the city. New bids will be received until Nov. 3. Bonds to the amount of $15,000 have been voted for the proposed plant.

NEW ORLEANS, LA.—The Electrical Supply Co., 326 Camp Street, New Orleans, it is reported, would like to receive prices on a 300-kw to 400-kw, two-phase or three-phase, 60-cycle, 2300-volt alternator directly connected to a compound or Corliss engine (second hand); also for a 200-kw to 250-kw generating unit same as above.

WEST MONROE, LA.—Bids will be received by N. G. Tippit, Mayor, until Nov. 14 for the installation of an electric-light plant and for enlarging the water-works system.

Pacific States

HARDWICK, CAL.—The State Railroad Commission has issued an order requiring the San Juan Lt. & Pwr. Co., of Fresno, to supply energy in the town of Hardwick.

LINDSAY, CAL.—Within the next three months the Tulare County Pwr. Co., of Lindsay, expects to purchase one 400-hp water-tube boiler (175 lb. pressure) and a boiler-feed pump. C. H. Holley is secretary.

SAN FRANCISCO, CAL.—Bids will be received at the office of the depot quartermaster, United States Army, San Francisco, until Nov. 5 for electrical supplies under Schedule 93 as follows: Eight annunciators, eight standard bells, 16 standard push-buttons, four brush-brass-finished buttons, 16 standard push-buttons, 25 switch-boxes, 19 boards and cabinets, two boards and cabinets, four service boards, six main-line switch boxes, 600 outlet boxes, 95 outlet boxes 14,040 ft. galvanized-iron conduit, 390 conduit couplings, 565 galvanized covers, 40 galvanized-iron covers, 1200 ft. lamp cord, 300 ft. cordage, 68 galvanized-iron elbows, 49 ceiling fixtures, 42 ceiling fixtures, two steam-tight ceiling fixtures, 64 electroliers, 60 bracket fixtures, 116 lamp guards, eight electroliers, 250 mica joints, 2015 galvanized-iron lock nuts, 18 watt-hour meters, two portable lamp guards, 30 receptacles, three gross brass wood screws, 55 holaphane shades, 720 shades, 100 shades, 12 shades, 1500 pipe straps, 280 fixture studs, 150 switches, 121 switch plates, three switches, 175 sockets, 10 lb. compound, 10 floor treads, 3000 ft. fixture wire, 14,000 ft. duplex wire, 2500 ft. single-conductor wire, one ammeter, one tool bag, two binders, 12 books, 100 socket bushings, 300 brass buttons, 12 testing clips, seven shunt coils, 500 ft. lamp cord, four condulets, 12 condulet fittings, two contacts, one tube cutter, 60 cartridge fuses, two pairs rubber gloves, 10 mica joints, two repair kits, 100 porcelain knobs, one portable ammeter, two watt-hour meters, 50 parts for wattmeter, one pair of pliers, seven pliers, four pliers, one reamer, one register, 500 meter seals, 10 shades or reflectors, 200 sockets, 24 condulet fittings, two sets of meter tools, one meter ceiling tool, one soldering copper, 30 floor treads, one pair of wire tweezers, one voltmeter, five wrenches, 125 cross-arms and three cast-iron water-pipe T's. For further information address Lt.-Col. W. H. Hart, denot quartermaster.

SOUTH PASADENA, CAL.—The city trustees have passed an ordinance providing for the installation of an ornamental lighting system on Fair Oakes Avenue and Huntington Drive. The plans call for iron posts covered with copper sheeting.

PECK, IDAHO.—The Peck Milling & El. Co., recently organized by Turner & Lantzy, with a capital stock of $50,000, contemplates the construction of a flouring mill and electric-light plant, to cost from $15,000 to $20,000.

ST. ANTHONY, IDAHO.—Application has been filed by the Mesa Pwr. Co., of St. Anthony, with the engineering department of the Ogden district forestry service for permission to erect a hydroelectric power plant at Big Falls in the North Fork of the Snake River in Idaho, and to erect a transmission line to points north of that place. The proposed plant will develop about 6000 hp and, with transmission lines, will cost, when completed, about $1,000,000.

Canada

EDMONTON, ALTA.—The Canadian Coal & Coke Co. has submitted a proposal to the city of Edmonton offering to supply energy to the city, the rates varying from 1.6 cents to ½ cent per kw-hr., depending on the amount taken. The company asks a contract for a period of 25 or 30 years. It is proposed to erect a steam generating plant at the colliery at St. Albert.

STETTLER, ALTA.—The by-law authorizing an expenditure of $5,000 for electrical equipment has been approved by the voters.

CORNWALL, ONT.—A by-law extending the franchise of the Cornwall St. Ry., Lt. & Pwr. Co. for a period of 20 years has been passed. The company is planning extensive improvements to its system.

LONDON, ONT.—Tenders, it is reported, will be called for two motor-generating sets to be used in connection with equipping the London & Port Stanley Railway for electrical operation.

MONTREAL, QUE.—Owing to financial conditions the new lighting system for St. Catherine Street has been abandoned for this year, but it is hoped to install the ornamental standards next season. Mr. Parent, superintendent of civic lighting, is also preparing plans for improving the lighting of the public squares.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Nov. 27 for furnishing electric incandescent lamps, as per Circular No. 877. For details see proposal columns.

New Incorporations

DUQUOIN, ILL.—The Carriers Mill Utilities Co. has been chartered with a capital stock of $5,000 to construct and operate an electric-lighting plant. The incorporators are H. E. Kimmel, W. E. Taborn and J. W. Beamer.

LAKETON, IND.—The Akron & Laketon Utility Company has been incorporated by W. K. Stevenson, V. J. Lidecker and others. The company is capitalized at $25,000 and proposes to furnish electricity to cities and towns in this vicinity.

ROANN, IND.—The Roann Lt. & Pwr. Co. has been incorporated with a capital stock of $10,000 to supply electricity. The incorporators are George H. Brodbeck, Dow Van Buskirk, R. F. Schuler, and others.

LEWISTON, MAINE.—The Androscoggin El. Co. has been organized with a capital stock of $2,000,000. The company is a merger of the Libbey and Dingley interests in Lewiston and the Chisholm interests in Rumford. Harold S. Libbey is president and Julius E. Parkhurst treasurer and clerk.

FESSENDEN, N. D.—The Fessenden Lt. & Pwr. Co. has been incorporated with a capital stock of $25,000 by Abram Baldwin, H. C. Witcomb, of Oberon, and O. J. Kauffman, of Velva.

ALLENTOWN, PA.—The Lehigh Township El. Lt. & Pwr. Co. and the Walnutport El. Lt. & Pwr. Co. have been granted charters. Each company is capitalized at $15,000 and proposes to operate electric light and power plants. The incorporators are H. R. Fehr, Charles N. Wagner and A. H. Cantlin.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCT. 20, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,111,848 (issued Sept. 29, 1914). MEANS FOR ELECTRICALLY DETERMINING TRANSMITTING POWER; W. E. McCoy and S. D. Sprong, New York, N. Y. App. filed April 1, 1912. A rotating power-transmitting shaft, two generators mounted thereon between the driving motor and the load and having terminals of like polarity connected in circuit with an electric meter interposed.

1,113,955. ELECTRIC INCUBATOR; E. F. A. Carey, Missoula, Mont. App. filed June 16, 1914. Maintains constant predetermined temperature.

1,114,003. MAGNETO; E. J. Kane, Chicago, Ill. App. filed Aug. 25, 1911. Inclosed rotor has an oscillatory movement.

1,114,007. ELECTRICAL SIGNALING SYSTEM; E. E. Kleinschmidt, New York, N. Y. App. filed Jan. 12, 1909. Improved track circuit.

1,114,044. TYPEWRITING - MACHINE OPERATOR; L. R. Roberts, Rutherford, N. J. App. filed March 16, 1910. Rotary power driver is rendered operative by depression of the keys.

1,114,048. CALLING DEVICE; H. O. Rugh, Sandwich, Ill. App. filed Sept. 1, 1910. For selective signaling circuits.

1,114,049. SIGNALING SYSTEM; H. O. Rugh, Sandwich, Ill. App. filed Sept. 1, 1910. Employing selective call boxes.

1,114,071. MAGNETIC SEPARATOR; G. Ullrich, Magdeburg, Germany. App. filed July 3, 1913. For simultaneously treating various kinds of ores.

1,114,078. TRAIN SIGNALING AND CONTROLLING SYSTEM; J. F. Webb, Jr., Denver, Col. App. filed June 8, 1908. Dispatcher controls all semaphores in his division and can stop trains independent of engineers.

1,114,089. ELECTRIC-LIGHT-ADJUSTING SOCKET; D. Yamada, Santa Ana, Cal. App. filed Nov. 17, 1913. Carries light-adjusting resistance sections.

1,114,096. MINER'S BLASTING BOX; J. Beeneck, Nanticoke, Pa. App. filed Dec. 11, 1912. Has a key-controlled circuit-closer.

1,114,118. RAILWAY TRAFFIC CONTROLLING SYSTEM; C. J. Coleman, New York, N. Y. App. filed July 30, 1910. Connection from signal to signal effected through track rails as conductors.

1,114,130. TROLLEY HANGER; J. T. Gary, Atlanta, Ga. App. filed Oct. 11, 1913. Adapted for use with differently sized wires.

1,114,149. ELECTRIC SWITCH; C. J. Klein, Milwaukee, Wis. App. filed Nov. 21, 1912. Operated by a single push-button.

1,114,174. CONTROLLING APPARATUS FOR TELEPHONE SWITCHING SYSTEMS; E. C. Molina, East Orange, N. J. App. filed Oct. 2, 1907. Has a single primary-controlling apparatus governing a plurality of secondary controllers.

1,114,207. ELECTRIC CIGAR LIGHTER; H. G. Weeks, Chicago, Ill. App. filed Aug. 5, 1912. Cigar is lighted by highly heated air instead of by direct contact with heater unit.

1,114,225. INTERRUPTING DEVICE; C. N. Cahusac, New York, N. Y. App. filed May 19, 1913. Electromagnetically closes circuit springs at definite periods.

1,114,275. ANNUNCIATOR; A. Lungen, New York, N. Y. App. filed Dec. 19, 1911. Made of a minimum number of stampings.

1,114,283. TROLLEY; J. M. Olinger, Springfield, Ohio. App. filed May 14, 1913. Trolley pole is quickly detachable from its stand.

1,114,340. NON-RENEWABLE FUSE; R. C. Cole, Hartford, Conn. App. filed March 17, 1913. Terminals, once assembled, cannot be removed without causing visual damage.

1,114,361. ELECTRIC DYNAMO; W. K. Howe, Rochester, N. Y. App. filed April 28, 1913. Annulus of magnetic material expanded into engagement with polar projections.

1,114,366. WIRE TERMINAL; G. C. Knauff, Chicago, Ill. App. filed Feb. 21, 1913. Particularly for sockets of auto-lighting systems.

1,114,379. PARTY-LINE EXCHANGE; N. E. Norstrom, Chicago, Ill. App. filed May 29, 1909. Improvements in substation apparatus.

1,114,380. TROLLEY BASE; W. J. Paul, Everett, Mass. App. filed Sept. 19, 1912. Pressure of the trolley is transmitted in line with the center of rotation of the trolley stand.

1,114,404. ELECTRIC HEATER AND HUMIDIFIER; W. C. Smith, Twin Falls, Idaho. App. filed May 16, 1914. Water jacketed so that vaporized liquid mixes with the heated air.

1,114,405. DYNAMO-ELECTRIC MACHINE PROVIDED WITH COMMUTATING POLE PIECES; C. H. Smoot, Hollis, N. Y. App. filed Sept. 5, 1911. Compensates for the demagnetizing action of the armature.

1,114,408. CORRECTING DISTURBANCES ON TELEPHONE AND OTHER LIKE WIRES; J. B. Speed, New York, N. Y. App. filed Oct. 29, 1912. Neutralizes the fundamental frequency and harmonies of the disturbing circuit by application of alternating currents possessing characteristics similar to said components of the disturbing current.

1,114,409. APPARATUS FOR CORRECTING DISTURBANCES ON TELEPHONE AND OTHER LIKE WIRES; J. B. Speed, New York, N. Y. App. filed Nov. 4, 1912. Beam of light produces a visual diagram indicative of the disturbance.

1,114,413. ELECTRIC SADIRON; E. E. Taeubert, Los Angeles, Cal. App. filed August 21, 1913. Heating wire threaded spirally through perforations in a mica sheet.

1,114,427. AUTOMATIC RAILWAY SIGNALING SYSTEM; C. L. Bonn, Hawkeye, Ia. App. filed Dec. 16, 1909. Indicates the respective positions of the trains.

1,114,428. AUTOMATIC RAILWAY-SIGNAL AND RELAY THEREFOR; C. L. Bopp, Hawkeye, Ia. App. filed Oct. 24, 1910. Accumulates impulses and later impresses them on the line.

1,114,429. AUTOMATIC RAILWAY SIGNALING DEVICE; C. L. Bopp, Hawkeye, Ia. App. filed Aug. 10, 1910. Indicates at station the positions of the various trains.

1,114,430. INDUCTION AUTOMATIC STOP AND CAB-SIGNAL SYSTEM; C. L. Bonn, Waterloo, Ia. App. filed July 26, 1912. No insulation required between adjacent blocks.

1,114,432. AUTOMATIC SIGNALING DEVICE; C. L. Bopp, Waterloo, Ia. App. filed Jan. 6, 1913. Cab signal embodying a pivoted magnetic needle and means for deflecting it.

1,114,477. RAILWAY SIGNAL; R. F. Hudson, Richmond, Va. App. filed Aug. 4, 1910. Traffic rails serve for conductors along the line of way.

1,114,496. SOUND INTENSIFIER; C. D. Lyon, St. Louis, Mo. App. filed June 13, 1912. Hollow conical shell attached to the perforated outer diaphragm of an ordinary telephone transmitter.

1,114,515. ELECTRIC-CIRCUIT SHUNT; W. H. Pratt, Lynn, Mass. App. filed Feb. 3, 1913. For measuring instruments.

1,114,516. ELECTRICAL MEASURING INSTRUMENT; D. R. Price, Brant Rock, Mass. App. filed Feb. 10, 1913. Electrostatic type.

1,114,517. INDICATOR; J. B. Purvis, Detroit, Mich. App. filed Dec. 31, 1910. For speed and direction; particularly for marine engines.

1,114,528. CASING FOR ALARM DEVICES; G. I. Rockwood, Worcester, Mass. App. filed Dec. 31, 1913. Fire alarm; clapper-operating waterwheel actuated by water released by sprinkler, and a diaphragm-operated electric alarm.

1,114,534. EXCITATION OF DYNAMO-ELECTRIC COMMUTATOR MACHINES; A. Scherbius, Baden, Switzerland. App. filed May 29, 1908. Uses a single or polyphase commutator-exciting machine.

1,114,548. TRANSFORMER; G. Stern, Berlin, Germany. App. filed Aug. 22, 1913. Plug switch by which the terminals of the groups of windings may be differently connected, beneath the surface of the oil.

1,114,558. PROTECTIVE DEVICE; E. B. Wedmore, Rugby, England. App. filed Aug. 19, 1909. For relays of the time-limit type.

1,114,565. ELECTRIC BURGLAR-ALARM SYSTEM; J. P. Williams, New York, N. Y. App. filed June 1, 1910. Permits access to guarded structure by authorized persons.

1,114,578. STOCK QUOTATION INDICATOR; R. W. Bumstead, Boston, Mass. App. filed June 22, 1905. Indicates maximum and minimum as well as market quotations.

1,114,597. SIGNALING SYSTEM; F. A. Emery and A. A. Adams, Brookline, Mass. App. filed March 13, 1909. Particularly for transmitting indications of range.

1,114,612. ELECTRICAL RECORDER; A. S. Hibbard, New York, N. Y. App. filed Feb. 14, 1912. For keeping tally on output of machines.

1,114,626. SERIES-MULTIPLE SWITCH AND CONDENSER FOR WIRELESS-TELEGRAPH SYSTEMS; T. B. Miller, Seattle, Wash. App. filed April 23, 1913. Series-multiple switches and condensers mechanically and electrically associated.

1,114,635. METHOD FOR CLEANING METALS; A. A. Nelson, Chicago, Ill. App. filed Feb. 25, 1914. Employs an alkaline electrolyte.

1,114,636. INDICATOR OR DETECTOR FOR LUBRICATING SYSTEMS; A. A. Nelson, Iowa City, Ia. App. filed July 9, 1913. Oil-supported float short-circuits magneto when oil is low.

1,114,642. APPARATUS FOR ELECTRICALLY CONTROLLING AIR BRAKES; E. L. Orcutt (deceased), Somerville, Mass. App. filed July 12, 1908. Has an electrically operated valve for setting the brakes and a manual valve for releasing the brakes.

1,114,654. FUSE CARTRIDGE; J. W. Steelman, Philadelphia, Pa. App. filed May 16, 1913. Fuse wire clamped between wedge-shaped blocks.

1,114,665. MANUFACTURE OF ELECTRICAL CONDUCTORS; T. B. Allen and L. B. Coulter, Niagara Falls, N. Y. App. filed Nov. 21, 1911. Impregnates a silicon-carbide article with a colloidal solution of graphite.

1,114,667. PROCESS OF MAKING ELECTRODES FOR SECONDARY BATTERIES; J. Apoznanski, Moscow, Russia. App. filed Dec. 14, 1910. Rapidly dries the paste filled in the grids and impedes the exit of gases.

1,114,680. ELECTRIC SWITCH; H. W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. A stationary cam member accelerates the movement of the operating member.

1,114,682. ELECTRIC SWITCH; F. L. Eager, Waterbury, Conn. App. filed June 16, 1911. Trolley wheel closes indicating circuit.

1,114,697. ELECTRON - DISCHARGE APPARATUS; A. W. Hull, Worcester, Mass. App. filed Dec. 29, 1913. Electron discharge is produced within a positive field.